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# Grinding and Finishing

FEBRUARY 1961 • 50 CENTS

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## How Cleveland Twist Drill Benefits from Management of Abrasives

ALSO IN THIS ISSUE:

**Why Surface Grinding is Replacing Cutter-Type Machining**

**A Cutter Grinding Problem Solved at Caterpillar**

**What You Should Know about Grain Types**

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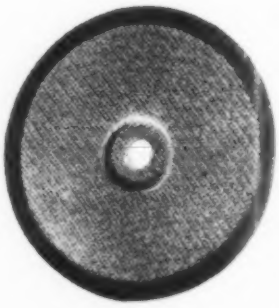

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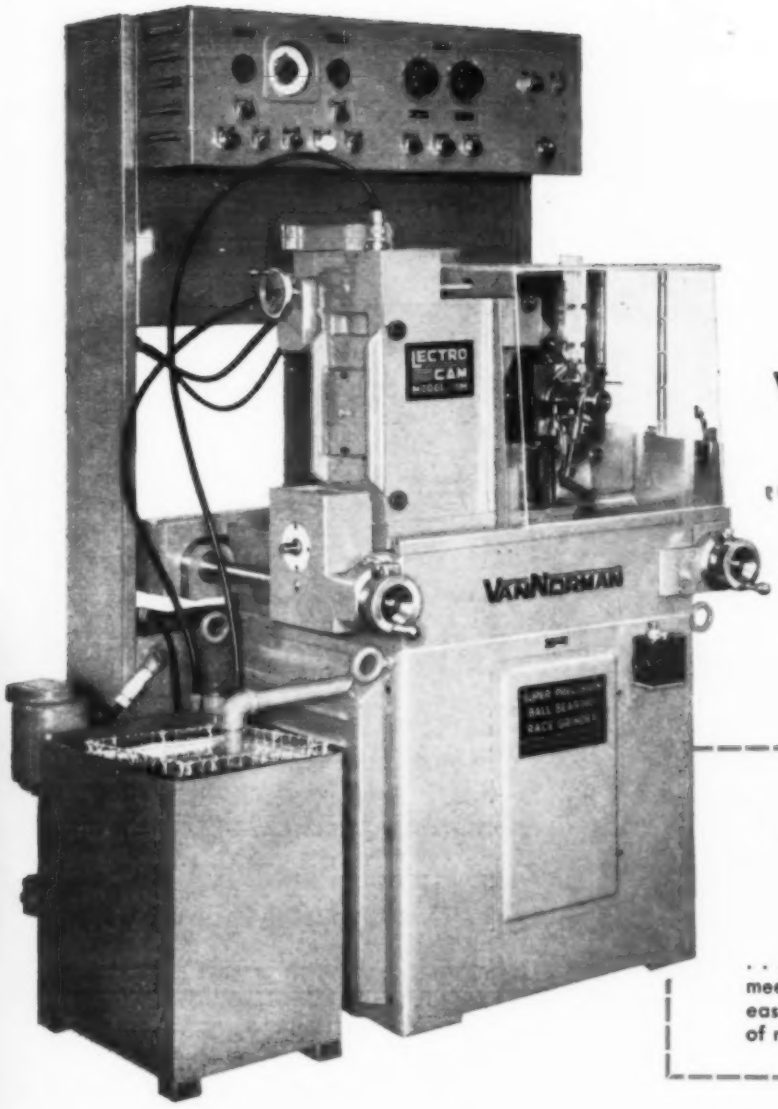


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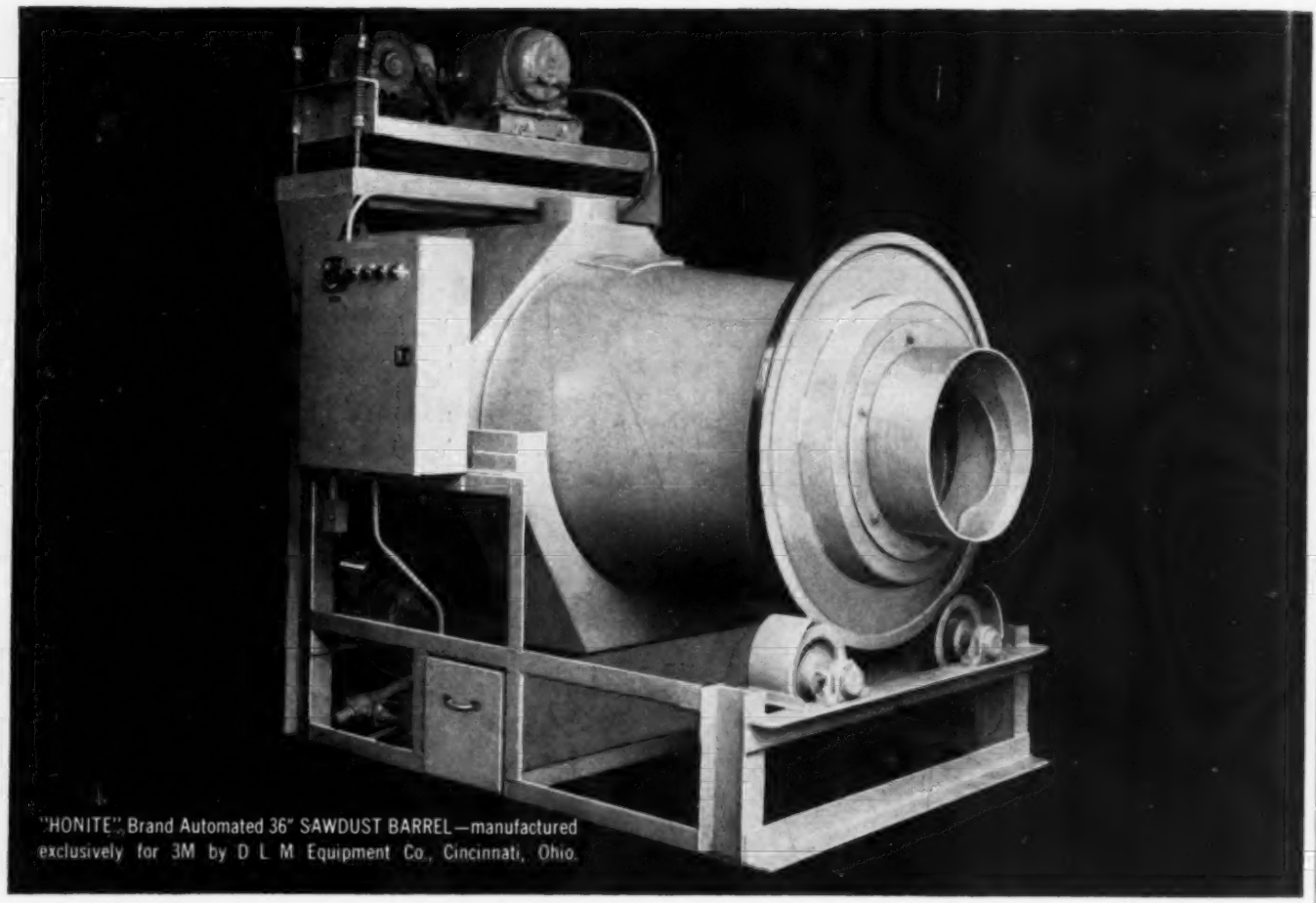

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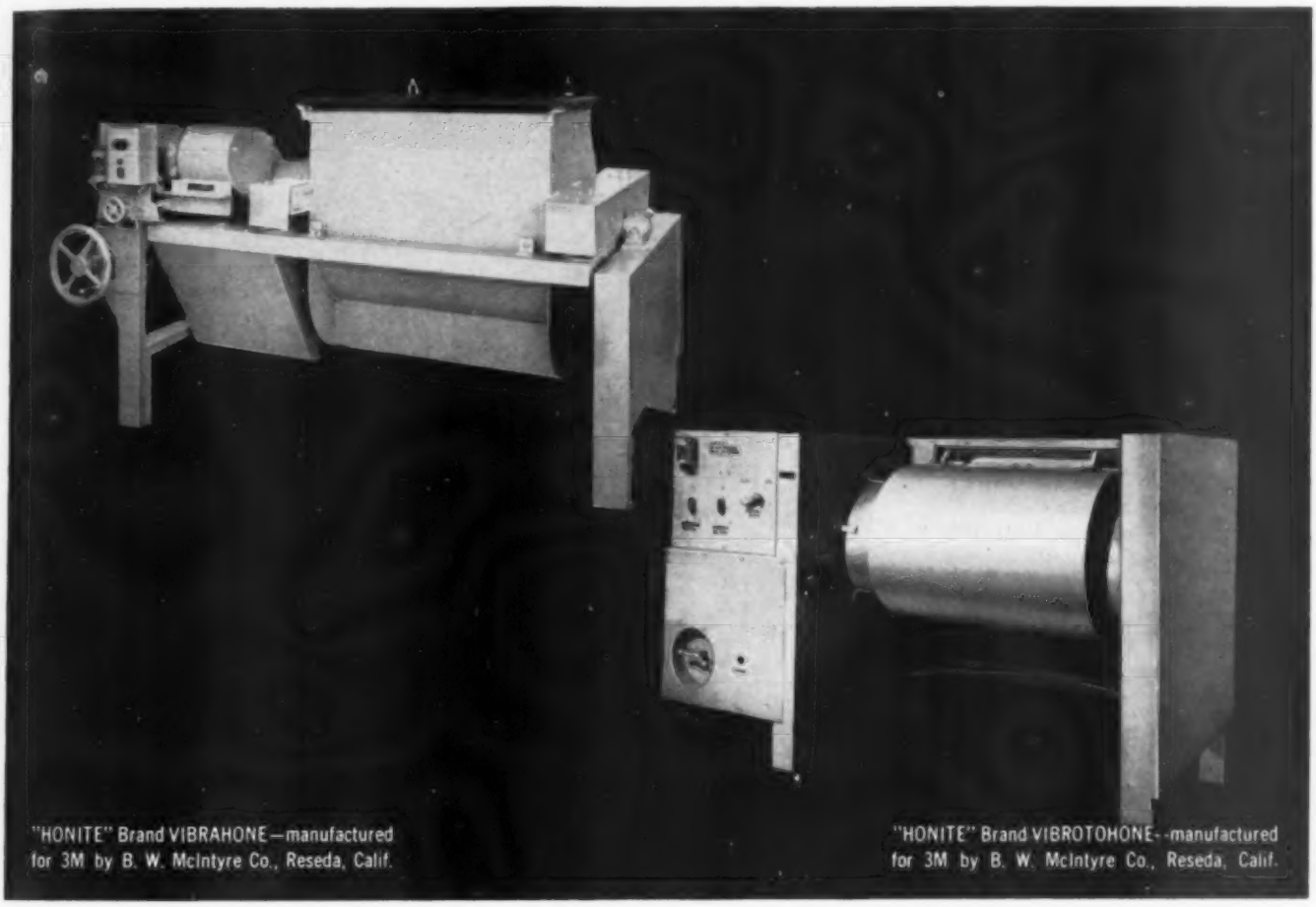

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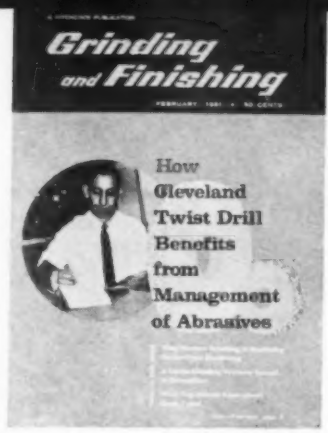


**February Cover:** This cover shows J. L. Cognata the abrasive specialist at Cleveland Twist Drill Company at his desk. The oval shape signifies a wheel while the artist has added two more wheels to the background with halftone photos of abrasive combined in the pattern.

# Grinding and Finishing

*For Better Production and Finishing with Abrasives*

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BPA

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# Editor's Mail

### BREAKTHROUGH FOR STAINLESS

We have read your article titled "A Breakthrough for Stainless Producers" which appears in your November 1960 edition on pages 48 to 51 inclusive.

In the third paragraph of this article you state:

"Solution of the investigation actually started with studies by the Behr-Manning Product Engineering staff some eight years ago. These studies developed the oil grinding process which meant so much to the present line."

This is not entirely the fact since Murray-Way recommended the oil grinding process and constructed the first wet abrasive belt grinding machine in 1948. This was for sheet stock.

The first wet abrasive belt continuous coil grinding line for stainless steel was furnished by Murray-Way Corporation to a steel mill in 1950.

We are glad to see that the savings from using the wet abrasive belt grinding process has been so satisfactory to a user who has had so vast an amount of prior experience in dry grinding.

All Murray-Way wet grinding lines from first to last are designed so that abrasive belt speeds can be varied by the methods you disclose and at the same time utilize variable speed traverse drives.

The article discusses many facts known in the industry for some time but which have never been so clearly summarized. You are to be complimented.

Incidentally, in 1953 Murray-Way constructed the first "grinding to uniform gage" (plus or minus .0005) machine, using a Sheffield X-ray gage measuring tool.

Murray-Way Corporation
R. Zech,
Secretary

---

### CORRECTION
**Industry Leaders Explain**

In the January issue three photo captions were interchanged. The middle photo at the top of page 28, captioned H. G. Bixby, Bryant Chucking Grinder Co., is A. C. Reppenhagen, Jr., of Mid-West Abrasives. Mr. Bixby's photo is immediately to the right, captioned W. F. Schlick, Sterling Grinding Wheel Co.

Mr. Schlick's photo is the top one on page 29, over Mr. Reppenhagen's caption.

### CHANGING FORMAT

This month brings the first of a number of physical changes which we expect will make GRINDING and FINISHING even easier to read and more attractive.

All major articles are now set up in three columns per page, in a different and very legible type face.

Three-column pages provide for greater flexibility in layout and for more varied and pleasing presentation. Shorter lines are easier to scan, but provide the same "meat" for more painstaking readers.

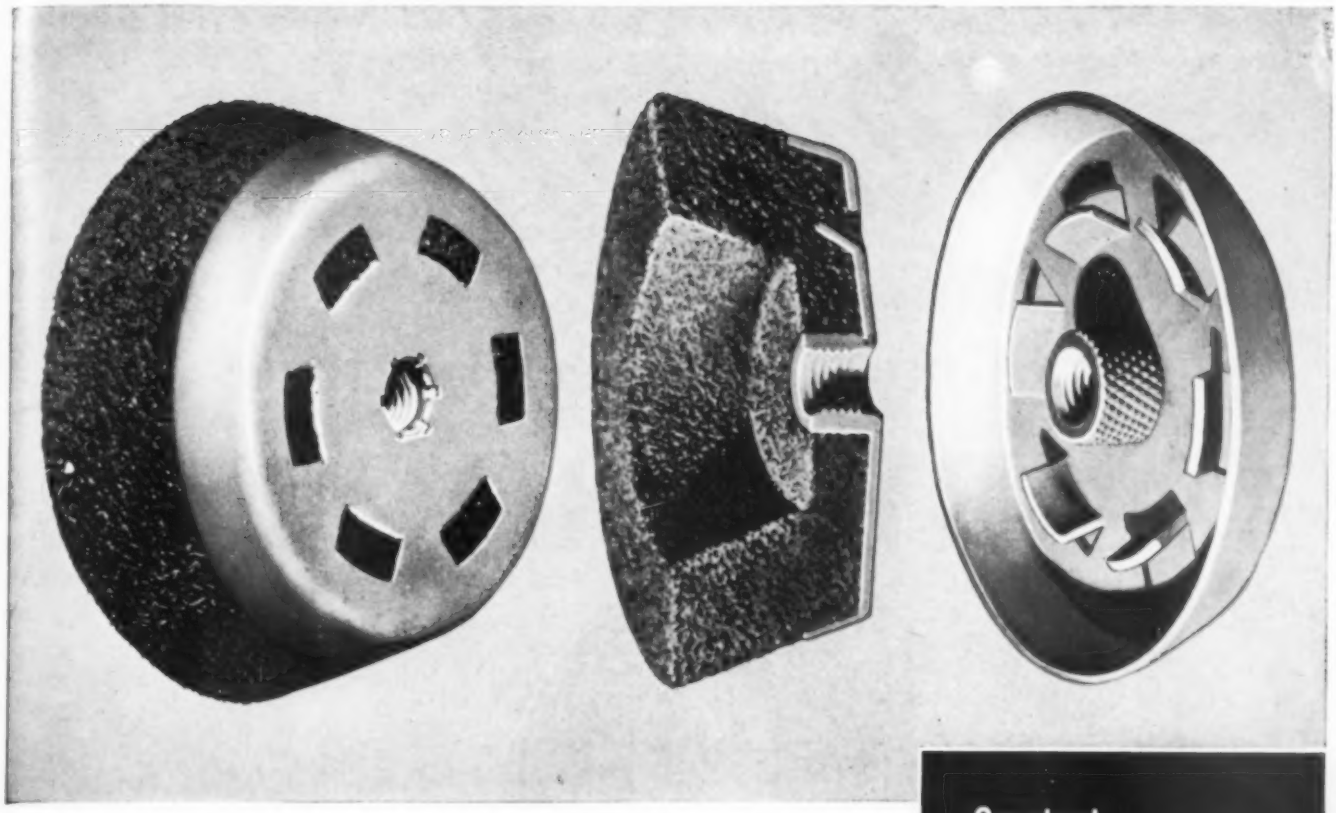
Type size in the back of the book has also been increased for better readability. In the Literature Section, more prominent headlines with the main copy indented make scanning to pick out items of interest much simpler.

The masthead, or contents page, has been shifted permanently to page 5.

The cover title has been changed from all-capitals to capitals and lower case type in the same style.

With these physical changes we want to continue and improve both the content and the quality of all editorial material from the lead article to the last news release, to bring to our readers as much information, pointedly written and attractively presented, as we possibly can. This is our first objective, as always.

The Editors



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For faster cutting, longer lasting, *safer* abrasive wheel performance — "More Use per Dollar" — be certain you get the original Manhattan Safety Back Flared Cup. Let your Manhattan abrasive wheel engineer show you the exclusive advantages of this and other Manhattan high speed, heavy duty abrasive wheels. Write for Bulletin 7157.

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# Announcing

## the Grinding Wheel Institute

# AWARD PROGRAM

**THEME:** Your Case for Grinding.

**PURPOSE:** The goal of this program is to uncover the many yet unwritten stories of beneficial applications of bonded abrasives. It is also intended to provide recognition to those in the metalworking industry who have increased the beneficial application of bonded abrasives.

**RULES:** All entries must be articles which describe actual bonded abrasive operations in the metalworking field which have proved to be beneficial to the user. The articles must be typewritten and include glossy photos and/or inked drawings if possible.

The article should include all pertinent information about the operation, equipment, abrasives and accessories. The article should answer the question, "How did the bonded abrasive operation benefit the manufacturer?" This should include comparison with previous operation if available.

Entries are open to everyone except employees of bonded abrasive manufacturers. Approval from company concerned should accompany the article.

Length of the article and number of photos and/or drawings are not limited. Use as many words or photos as are required to tell the story clearly. Every article will be accepted or returned within one month of receipt. All publishing rights to the articles will become the property of Grinding and Finishing. Send all entries to Grinding and Finishing, Wheaton, Ill.

**JUDGING OF ACCEPTANCE:** All articles will be judged on the importance of the benefits and completeness of the information. Literary ability *will not* have any bearing on acceptance or rejection of an article. Those articles accepted will not be limited to one per month nor will they be based on a comparison of those received. This is not a contest.

**AWARDS:** For each article accepted the author will receive $50 and a plastic encased copy of the article as it appeared in Grinding and Finishing. These will be presented formally.

**TIME OF PROGRAM:** The program will start as of this publication. Judging starts February 1st with the first article accepted being printed in the March issue. The length of the program will not be set as it is felt by the sponsors that there is a wealth of information available and that only lack of participation will determine length.

**SPONSORS:** Grinding Wheel Institute in cooperation with Grinding and Finishing.

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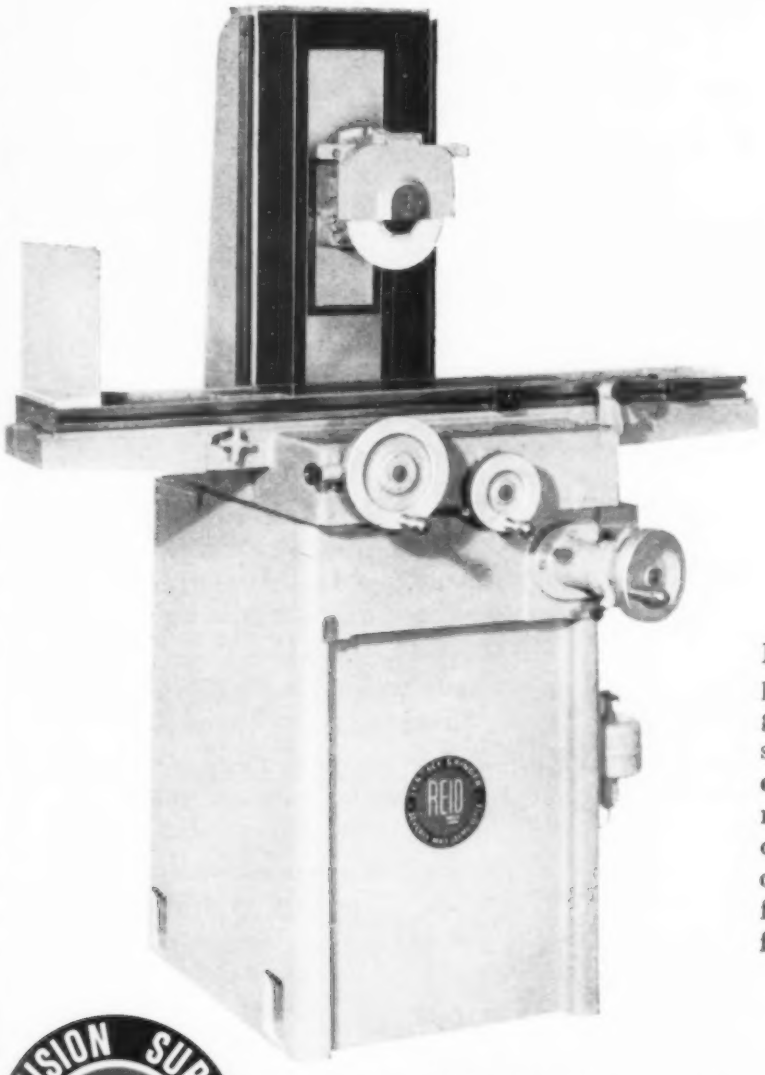


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REID's newest surface grinder, *the 618 HR* provides the easiest moving hand operated grinding table on the market. Heavier in construction with precision ground, matched rollers, the Reid 618 HR results in greater accuracy at lower cost. Check the important extras on REID grinders. . .compare work results. . . compare price . . . and you'll agree; Reid surface grinders are industry's number 1 choice for value!

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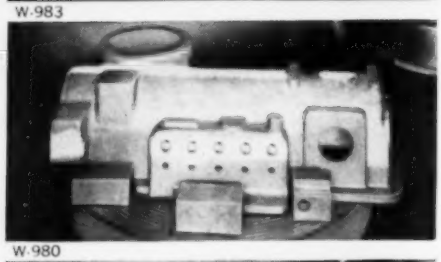

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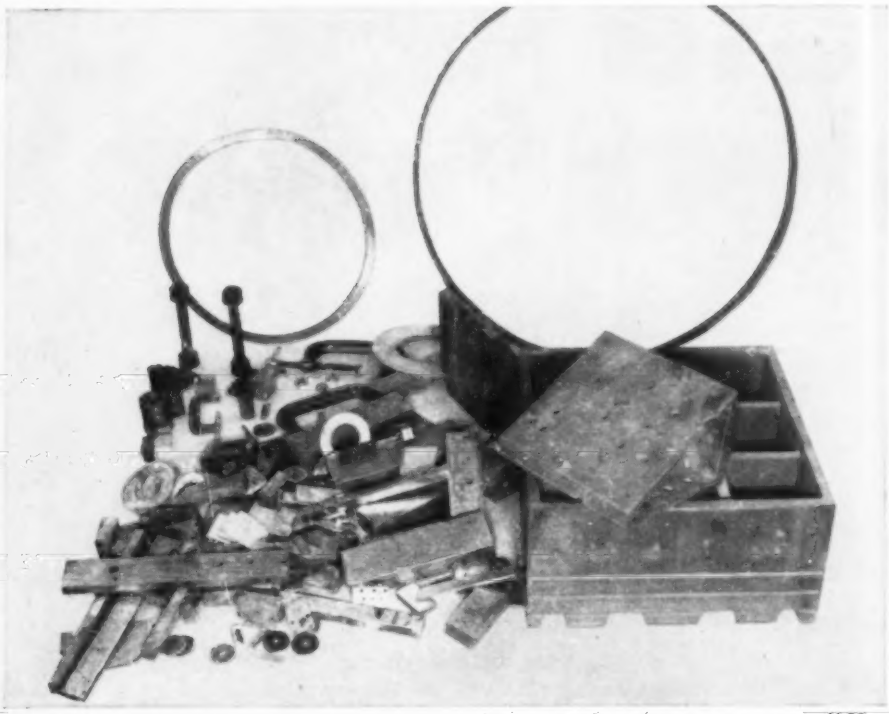
# BLANCHARD GRINDERS



M-59

## *Use Industry's Least Expensive Fixtures . . .*

Normally, the Blanchard magnetic chuck will hold ferrous work pieces during the grinding cycle.

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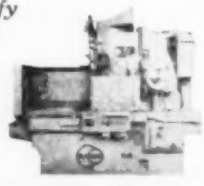
Write today for your free copy of "Work Done on the Blanchard", Fifth Edition, and "The Art of Blanchard Surface Grinding", Fourth Edition.

*For Best Results, Always Specify Blanchard Grinding Wheels for Blanchard Grinders.*



No. 18

***PUT IT ON THE*** BLANCHARD **THE BLANCHARD MACHINE COMPANY**

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# Design for Grinding

RICHARD L. McKEE • Managing Editor

# Automatic Abrasive Cut-Off Halves Screw Machine Costs

● Shifting a cutting operation from automatic screw machines to an abrasive cut-off machine has been a key factor in a cost-slicing methods change for making roller bearing blanks at Chain Belt Company's Shafer Bearing Division. In the sequence of changed operations, costs slid from $1.90 to 59¢ per hundred, though the total number in the sequence was increased.

Total cost of the finished rollers dropped 45%.

Further, the abrasive cut-off machine has ample capacity to meet present and anticipated production levels without increasing the labor force. It is capable of still further savings in materials and labor cost, should they become sufficiently critical.

These aircraft rollers are cut from 1/4″ and smaller rods of 52100 steel. Hardenable stainless is also coming into use. In passing, it can be noted that this would be difficult to handle on screw machines, but causes no difficulty to the abrasive cut-off wheels.

**TABLE A**
**Comparative Costs of Automatic Multiple-Spindle Screw Machine Cutting and Automatic Abrasive Cutting-Off**

| SCREW MACHINE OPERATION | COST PER 100 PIECES |
|---|---|
| Cut off—2 at a time | $1.32 |
| O.D. grind to finish size | .17 |
| End grind to size | .41 |
| Total | $1.90 |
| **ABRASIVE CUT-OFF OPERATION** | **COST PER 100 PIECES** |
| Cut off—8 at a time | $ .18 |
| Tumble deburring | .06 |
| Green grind—centerless | .12 |
| Tumble for corner radius | .06 |
| O.D. grind to finish size | .17 |
| | $ .59 |

### Operation Comparison

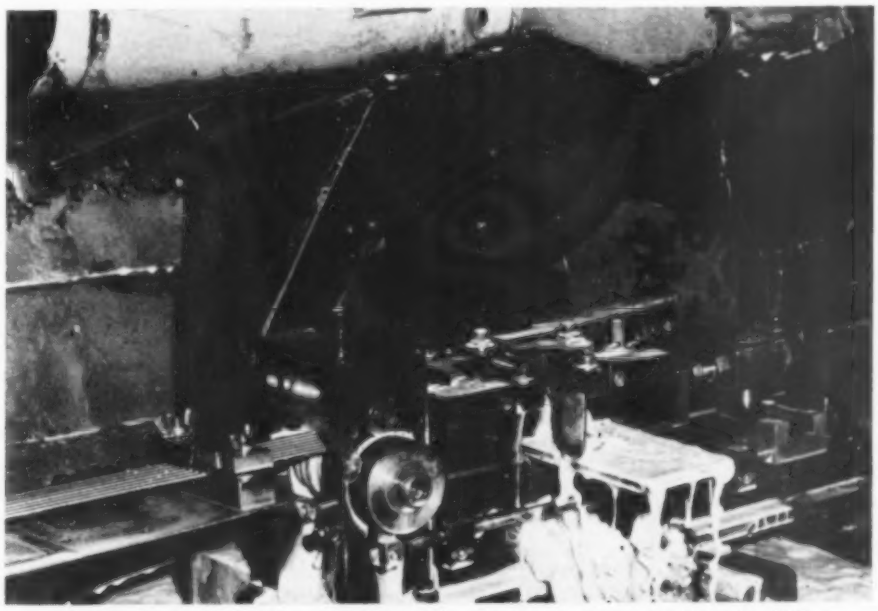
Table A is a listing of the operations affected by the change. The most drastic reductions were the changes in cost of cutting off and the elimination of end grinding. Abrasive wheels provide a ground end which is accurate to within plus or minus 15 "tenths" (.0015″).

Added operations are the tumble deburring, a short run to remove the slight burr left after grinding; a "green grind" on a centerless; and a second tumbling operation to produce a slight radius on the corners of the rollers. All three are high-volume, low-cost processes.

The O. D. grind to finish size was unchanged.

### Production Increase

Production per shift on automatic screw machines is about 6,000 pieces for the multiple-spindles, and about 3,000 for single spindles. To achieve the current abrasive cut-off machine production of 40,000 per shift would require at least six of the multi-spindle machines, or a dozen of the others, with three or four operators. Such an arrangement in view of other possibilities was considered impractical. It was this limitation that originally sparked the change to abrasive cut-off.



**Automatic wet abrasive cutting, with rods fed in from the left. Carbide guides are immediately under the wheel.**

# "What have you done about this DUST?"

In our plant trouble is spelled D-U-S-T. And our plastics production V.P. wanted to know what I had done to get rid of it. He was mad, and frankly, I didn't blame him. Dust was costing us a lot of money each year—in machine wear, misalignment and down time—to say nothing about absenteeism and poor morale among the workers. How could the plant help but be dusty—with grinders, lathes, milling and molding machines running 16 hours a day.

But I explained that I had checked on several dust control systems. The problem was that in 6 months we planned to expand and re-model the shop. It seemed like throwing good money after bad to invest in a control system now. But the V.P. wanted action. He told me about a Torit engineer who had called on him claiming he had a dust control system that offered complete *flexibility*. Then he gave me his card and suggested I call him immediately.

Believe me, I called that Torit man, but fast. He explained to me the flexibility his system offered—how with just minor changes it could be adapted to the new plant layout. I bought one of his Torit Model 24 Cyclone machines for less than $1,000. It services 2 molding machines, a double-end grinder, 2 lathes and a milling machine. And it really performs—has practically eliminated the dust in our shop. We're finishing our expansion and I have ordered another Torit Dust Collector to service our additional machines. You'd hardly recognize our shop now. It's clean. Production is up—morale is up—absenteeism is lower than ever.

*Torit can solve your dust problems. For complete facts on dust . . . and how to control it . . . write*

*Cyclone Model 24*

**TORIT manufacturing company**

*1133 Rankin St., St. Paul 16, Minn., Dept. 532*

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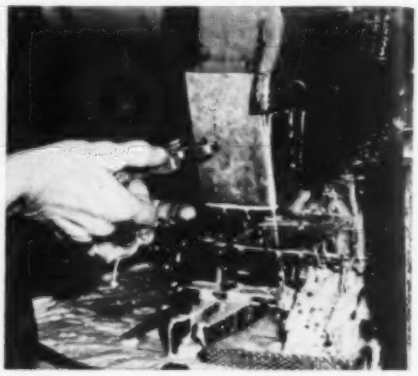
**Machine Description**

The machine itself is a standard de Sanno manually-operated chop-stroke abrasive cut-off unit, modified for automatic operation, and equipped with automatic feed. Bellows Hydro-Checks act as shock absorbers on both wheel and material infeed. Carbide guides keep the wheel from swerving in the cut. Rods are clamped flat, eight at a time, on the feed mechanism.

Grinding wheels are 18" x .050" x 7/8", 80 grit rubber-bonded aluminum oxide, P grade. Still thinner wheels are being tried, because it has been found that thin wheels produce a better quality of cut in addition to conserving materials. The first wheels used on the application were .062" thick. Three wheels are used up per shift; each change involves about five minutes of downtime.



**Operator checks rollers for length with dial indicator, an operation that could be done later in the process.**

**Further Possibilities**

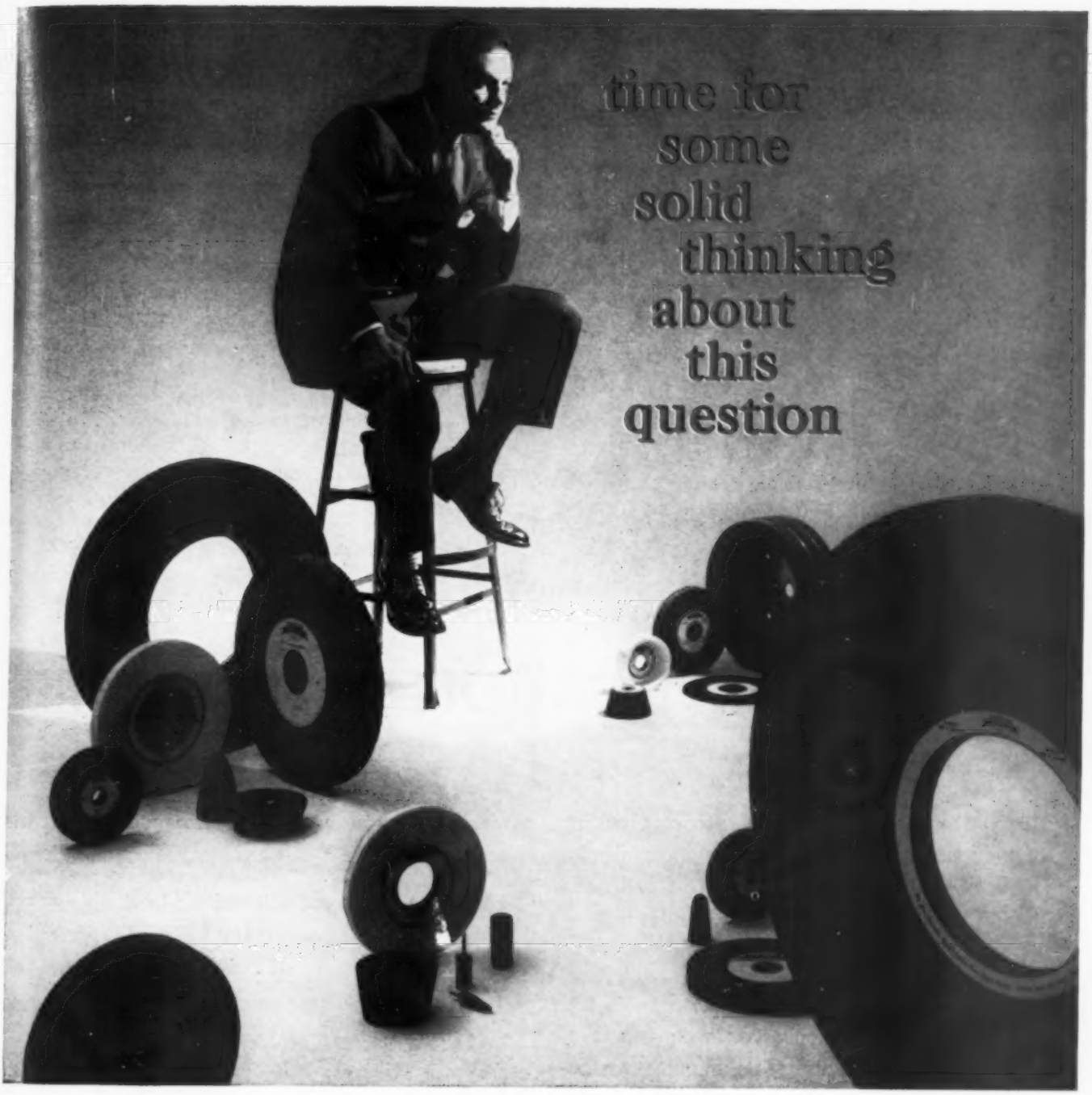
Improvements to date have been substantial. They have, however, in the opinion of the men in charge, by no means exhausted the possibilities. They feel that larger diameters than the present 1/4" could be profitably handled the same way. These larger sizes are still on the automatic screw machines.

Feeding stock from coils through a straightening fixture would make use of material now lost as rod ends, reduce the time required for loading the automatic feeder.

The need for a full-time operator is questionable. Currently, her time is spent mainly in spot-checking length of the pieces, an operation not entirely necessary at that stage in the process.

Immediately, though, the advantages of further refinement of the process have not justified the time and expense that would be involved.

• • •

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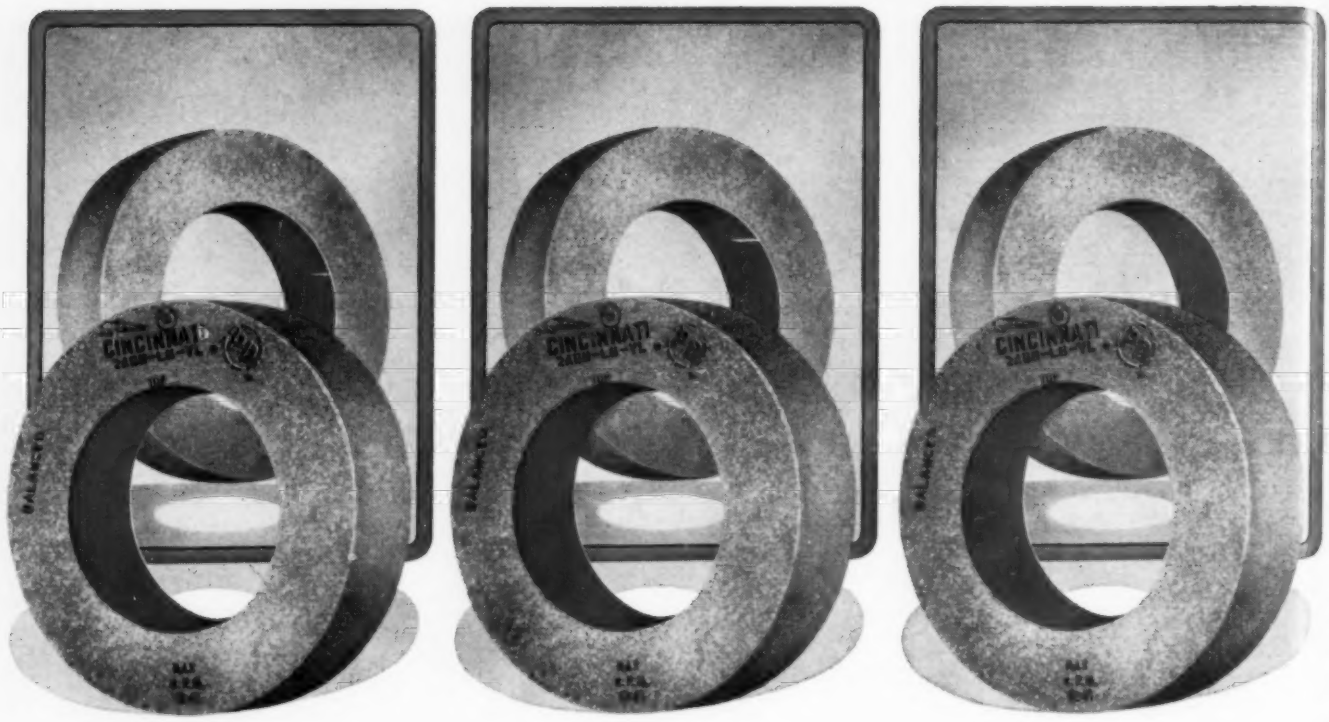
**Use postpaid card. Circle No. 212**



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For example, the six steps to grain uniformity are these: Grain size verified with screens . . . Grain cleanliness . . . Freedom of foreign matter . . . Color . . . Magnetic content . . . and Bulk density must all meet rigid standards.

## RESULT: DEPENDABLE PERFORMANCE

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Using Ⓟ WHEELS you will find production going up, and costs going down . . . *to stay!* This is the promise—and the *performance*—of Positive Duplication.

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Solve your grinding problems with the help of specialists trained by the Cincinnati Milling Machine Company. Their wide experience in job set-ups and grinding operations is at your service. Just call your CINCINNATI Ⓟ GRINDING WHEELS Distributor or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

Ⓟ POSITIVE DUPLICATION

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GRINDING WHEELS

°Trade Mark Reg. U. S. Pat. Off.

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## CAM-OPERATED DRIVER SAVES TIME IN CENTER GRINDING

By M. W. Loftus

• When grinding work between centers, considerable time can be saved by using a work driver similar to the one sketched.

Cam-operated, it requires no tightening or loosening of screws.

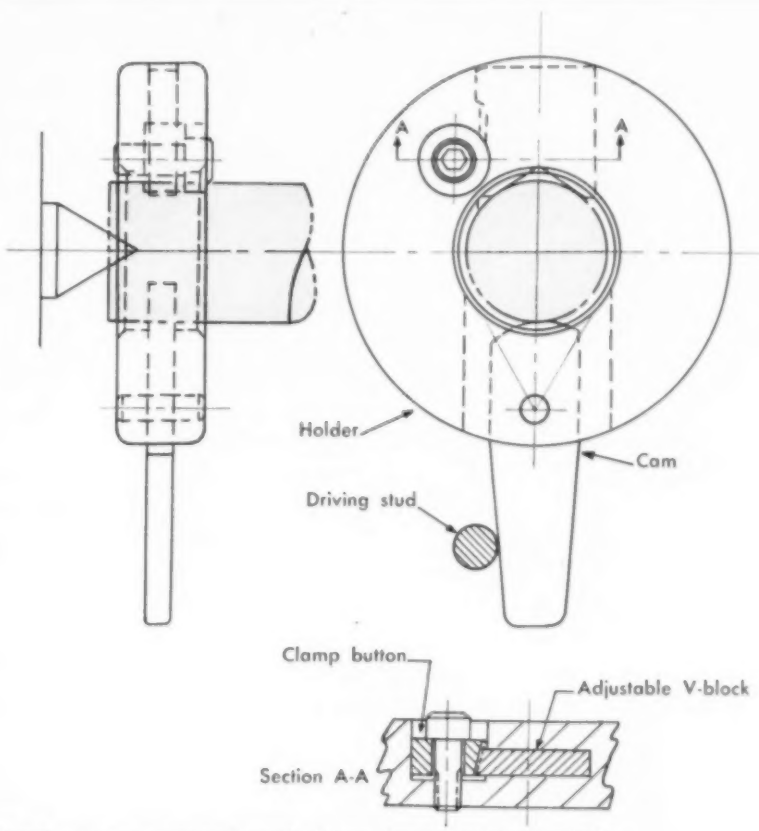
The driver shown was made for a range of work diameters 3/4″ to 1-1/4″ and is sketched with a maximum size part in place.

The sliding V-block, with a 120° V, has a 10° bevel on one side, with 90° serrations spaced 1/16″ apart cut into the surface.

The mating clamp button fits into a counterbored hole, and has a corresponding side beveled and serrated. A socket head screw clamps the V-block in place after adjustment.

The cam, working in a slotted opening in the holder, has a working surface extending 60°, and with a lead angle of 5-3/4° laid out from a base circle with a radius of 11/16″.

With these proportions the work will be effectively clamped against the cam.




**Sketch of cam-operated work driver for cylindrical grinder.**

## WALL PANEL PROVIDES ORDERLY TOOL STORAGE

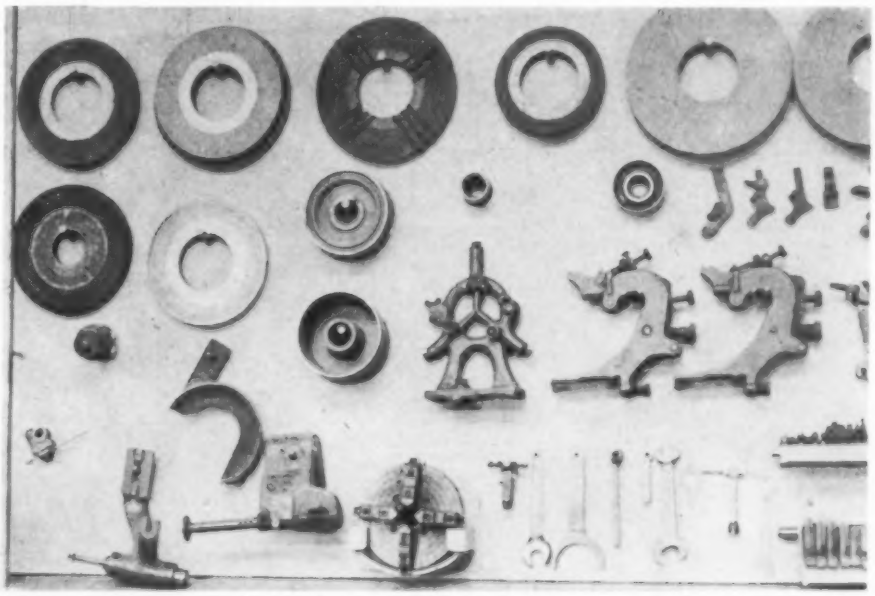
By H. J. Gerber

• Every shop has problems in storing machine tool accessory equipment, so that it is readily accessible when needed, but still out of the way.

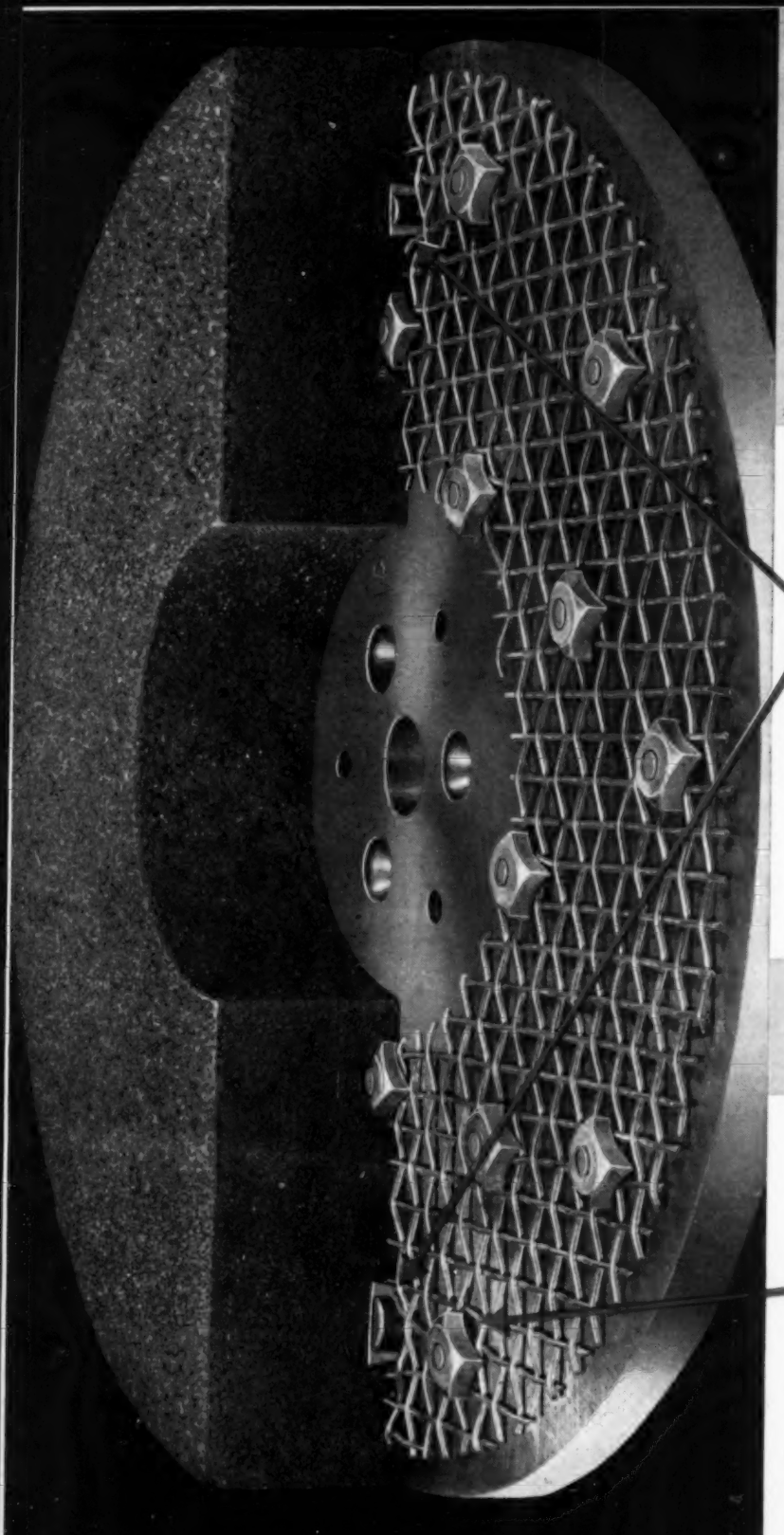
We make use of large wall panels like the one illustrated. This panel holds all of the commonly used accessories, wheels and wrenches for one of our cylindrical grinders.

The panel should be placed somewhere near the machine for convenience. Location of wrenches and other often-used small items should be silhouetted on the background so that they will be replaced in the same holders each time, and so that missing tools can be readily identified.

• • •



**Wall panel with suitable holders provides convenient storage for tools and accessories, reduces chance of loss or misplacement.**



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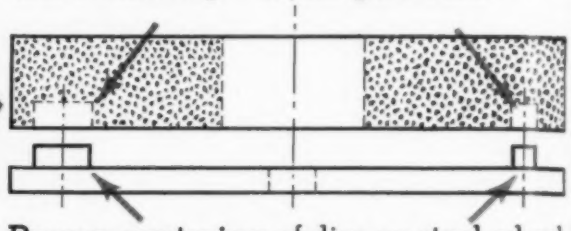
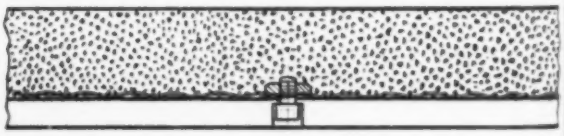
***truer running—closer precision***



**Proper centering** of disc on steel wheel assured by Tru-Lok.

**Greater accuracy**—Tru-Lok eliminates run-out and vibration caused by off center mounting.

**Gardner WIRE-LOKT® construction**
***maximum safety—maximum economy***



**Full value**—the entire rated thickness of the abrasive is usable.

**Safety**—heavy, imbedded steel mesh assures maximum safety.

**Call the man who can give you the *most* in practical, cost saving help with your flat surface grinding . . . your Gardner Abrasives Specialist.**

# GARDNER

abrasive disc

BELOIT, WISCONSIN

# Abrasive Engineer's Corner

ARTHUR RAKESTRAW • Contributing Editor

## Centerless: Better Finish, Automatic Gaging . . . Stainless Welds

### IMPROVING SURFACE FINISH IN CENTERLESS GRINDING

**What suggestions can you make for improving surface finish in centerless grinding of 52100 steel for various types of gages? We are using 57A60-L5-VBE grinding wheels, 20 x 6 x 12, on a Cincinnati No. 2 centerless. Present finish is in the range of 8-10 micros. We would like to get 5 micros or under.—E. U., Chicago, Illinois.**

Before you make any change in wheel specification, I would suggest that you investigate a change in the type of diamond truing medium. In several instances, a decided improvement has resulted from a change to a luster-type diamond mounting. Apparently the several diamond points in contact with the abrasive wheel produce a much finer dress than would normally be obtained by a single point diamond.

Should you desire to secure a further finish improvement, however, I would suggest that you obtain a wheel similar to what you have been using, but one grade softer in 80 grit. To be specific, a 57A80-K5VBE.

### PREPARING SAMPLES FOR MICROSCOPIC EXAMINATION

**What procedure would you recommend for grinding and finishing ductile iron samples for microscopic examination?—A. M. H., Talladega, Alabama.**

The preparation of metallic samples for microscopic examination involves a series of operations, each performance a definite surface refining function.

You mentioned that you have a small machine shop. Unless you are required to prepare such samples in quantities large enough to justify acquiring the proper equipment and materials, it might be to your advantage to arrange for the preparation of these samples by some laboratory which is set up for this type of work.

Assuming that the samples have been cut off in a machine that has produced a comparatively good finish, the first operation is rough grinding.

This operation is usually performed on vertical lapping machines, either wet or dry. Paper discs of 240, 320, 400, or 600 silicon carbide abrasive refine the sample surface.

The second operation is rough polishing on cloth covered discs using diamond abrasive in paste suspension.

Final polish is produced on cloth covered laps using very fine alumina. The degree of dampness is very important.

Under separate cover I am enclosing several pamphlets from a company with long experience in this field. I am sure you will find them helpful.

"Nuts with the abrasive forces of Nature! I have to have these parts tomorrow!"

### AUTOMATIC GAGING: SHORT-RUN WORK ON CENTERLESS

**• Can you give me some ideas for automatic size control for short-run work on centerless grinders?—R. J., Jamestown, New York.**

It has been our experience that automatic sizing devices such as you have mentioned have usually been employed on established runs where the quantity of pieces produced has been comparatively large. The time required to make the necessary changes in setup for changes in piece size hardly justifies its use on short-run jobs.

I have learned that Cutler-Hammer, Inc., 400 North 12th Street, Milwaukee 1, Wisconsin, have developed an electronic gaging device which can be used on centerless grinders. I understand that this device gages the finished ground part, compensating for wheel wear by incremental feeding of the regulating wheel.

I'd suggest that you might want to contact Cutler-Hammer directly for detailed information and descriptions.

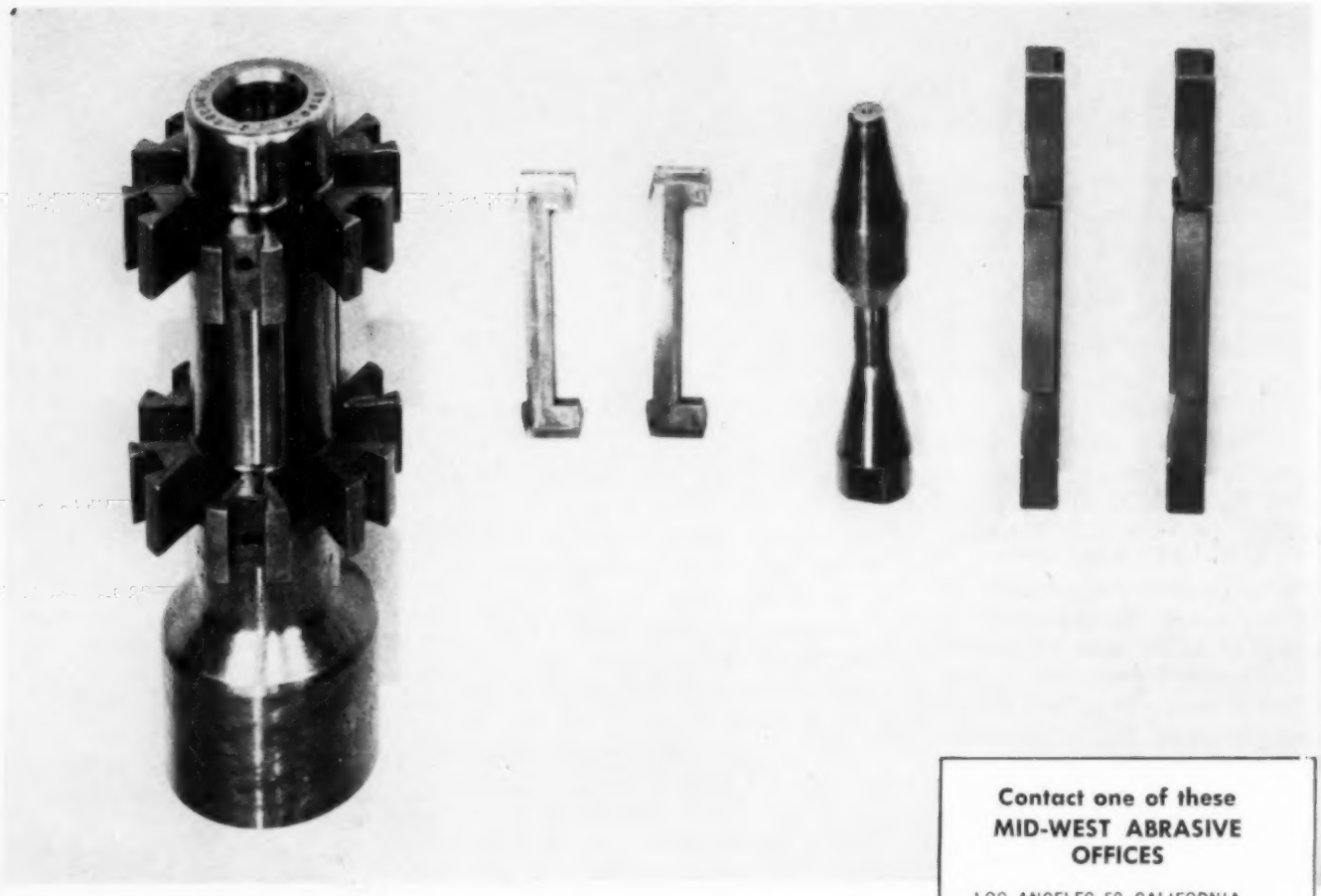
### FINISHING STAINLESS STEEL AFTER WELDING

**• What procedure would you recommend for finishing 302 S/S to a No. 4 finish after welding?—H. S., Los Angeles, California.**

As far as I know, there is no particular procedure or sequence of operations in finishing welds in products such as you manufacture.

Portable grinders mounting rubber wheels of about 80 grit, R grade, in suitable widths and sizes, should provide a suitable rate of stock removal and an adequate finish.

Some practice in the grinding technique may be necessary before the operator catches the knack of smoothing the welded surfaces without small chatters. • • •



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# Editor's Page

FEBRUARY, 1961

## The Vanishing American Asset

Over and over we have heard the American manufacturer complain about the terrible condition of the world market and how this situation is hurting his business. I'm sure we have all heard about enough and realize it's time to do something about it. We may even have joined in this cry from time to time but have we ever looked at our progress, if any?

This progress isn't in the fight with unions, higher tariffs, a reduction of foreign aid, a better tax break and it isn't in government control. But, it is in the exploitation of this country's greatest asset, Yankee Ingenuity.

We have spent so much time complaining about how bad things are and how much someone else should do about it that we have completely forgotten the biggest advantage we have over other countries. We must face the fact that we no longer compete with only our neighbor who has the same advantages as we do. Our competition is with others who have advantages in different areas and will use them to the greatest possible extent.

It's past time for us to get off the hind side and do something with the advantages we have. I can't count the number of times people have said that a judgment was made on "past experience." And yet, isn't this a one-way ticket to obsolescence? How can you say a new process is not better because of past experience? This country grew to its present position because in the past we always looked for a better way of doing it and exploited our greatest asset, ingenuity.

We expect Americans to buy American products, so let's provide American products that are of the quality and the price which will accomplish this and not depend upon patriotism to sell a product that is not as well built and costs more.

This is going to take a little more of your time and a little more of my time. This time is not in addition to what we have to do, but is, in fact, something which must be done if we are to maintain our world position and possibly our society. It can be done and will be done. With ingenuity we can regain our losses to foreign products, stop our loss of gold revenues, regain our high position in the world and correct any number of problems which we now only complain about.

W. W. Patterson

Editor

Thomas Samar, project engineer with the methods department, is shown here with Joseph Cognata, abrasive specialist, checking the results of Samar's test run on a cylindrical grinder. Every new operation is test run by a member of the methods engineering department in cooperation with the abrasive specialist.

# How Cleveland Twist Drill Benefits from Management of Abrasives

By M. M. PATTERSON
Editor

Obtaining greatest benefits from abrasive operations is an objective at The Cleveland Twist Drill Company. The management of this company recognizes the vital need for close control of abrasive operations, one of their most important methods of manufacture.

● The Cleveland Twist Drill Company for more than ten years has used their own abrasive specialist to obtain the greatest benefits from their grinding operations. These benefits, consisting of dollar savings and higher product quality, can be great in view of the fact that 50% of their metal removal operations are performed on equipment valued in excess of $5,000,000.

Their procedure for control of abrasive operations is as follows:

(1) Methods engineering encourages the assistance of machine and abrasive representatives to provide new methods or products for consideration.

(2) The abrasive specialist is an expert in the Methods Engineering Department.

(3) When new equipment is installed, a Methods Engineer or Engineering Technician actually operates this equipment to establish optimum cycles.

(4) During the cycling of new equipment, the abrasive specialist develops the grinding wheel specifications for the particular job.

(5) Usually, for initial testing, three wheel specifications are tried.

(6) New abrasive products are continually tested against our present abrasives in order to maintain the most efficient operation.

(7) Greatest benefits are gained from wheels designed for the specific job.

(8) Wheels are bought by the Purchasing Department from specifications established by the abrasive specialist.

(9) The satisfactory trial wheel specification is checked by the purchase of a small quantity of this same specification.

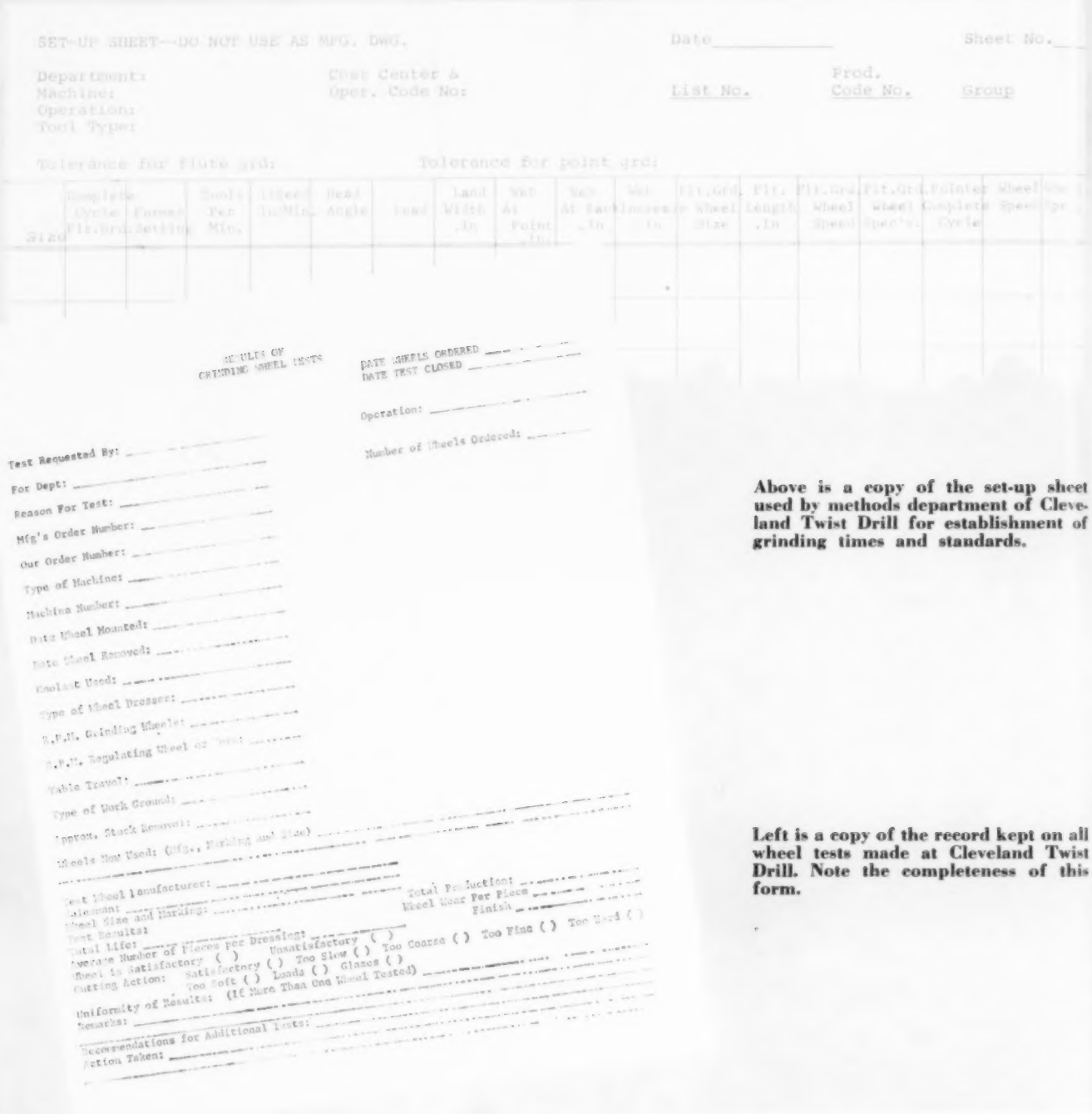
(10) A maximum of three months' supply of grinding wheels is maintained to minimize obsolescence and reduce inventory.

(11) Communications and education are an important part of the abrasive specialist's job.

The Cleveland Twist Drill Company has a friendly, yet efficient, atmosphere which sets the stage for the most up-to-date abrasive management program in industry. In doing this, they foresee a steady increase in the use of abrasives as a means of metal removal. The organizational setup, therefore, is such that it encourages engineering and guidance from the suppliers of abrasives and grinding equipment. This point is extremely important, as it is through this close cooperation that additional benefits are obtained.

The Methods Department is composed of a group of engineers, technicians, and an abrasive specialist. It is their responsibility to select, engineer and recommend the purchase of machines, abrasives, diamonds and coolants. The machines and their grinding methods are selected by the engineers and technicians from their experience and contacts with equipment sales engineers. After the decision to purchase equipment has been made, the Abrasive Specialist, J. L. Cognata, obtains from the engineer or technician assigned to the job, all information necessary to specify trial grinding wheels. Wheel specifications are then derived from both Cognata's

**Shown here is the methods department of Cleveland Twist Drill Company. The members in this department not only engineer and recommend equipment and methods for production of the products, but also actually run the machine after it is installed.**



SET-UP SHEET—DO NOT USE AS MFG. DWG. Date Sheet No.

Department: Cost Center &
Machine: Oper. Code No: List No. Prod. Code No. Group
Operation:
Tool Type:

Tolerance for flute grd: Tolerance for point grd:

| Size | Complete Cycle Fit.Grd. | Formed Setting | Tools Per Min. | Lines To Min. | Head Angle | Lead | Land Width .In | Web At Point .In | Web At Back .In | Web Increase in | Fit.Grd. Wheel Size | Fit. Length .In | Fit.Grd. Wheel Speed | Fit.Grd. Wheel Spec's. | Pointer Complete Cycle | Wheel Speed | Type |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | |

RESULTS OF GRINDING WHEEL TESTS

DATE WHEELS ORDERED
DATE TEST CLOSED

Operation:

Number of Wheels Ordered:

Test Requested By:
For Dept:
Reason For Test:
Mfg's Order Number:
Our Order Number:
Type of Machine:
Machine Number:
Date Wheel Mounted:
Date Wheel Removed:
Coolant Used:
Type of Wheel Dresser:
S.F.M. Grinding Wheels:
R.P.M. Regulating Wheel or Work:
Table Travel:
Type of Work Ground:
Approx. Stock Removed:
Wheels Now Used: (Mfgr., Marking and Size)

Next Wheel Manufacturer:
Abrasive
Wheel Size and Marking:
Test Results:
Total Life:
Total Production:
Wheel Wear Per Piece
Finish
Average Number of Pieces per Dressing:
Wheel is Satisfactory ( ) Unsatisfactory ( )
Cutting Action: Satisfactory ( ) Too Slow ( ) Too Coarse ( ) Too Fine ( ) Too Hard ( )
Too Soft ( ) Loads ( ) Glazes ( )
Uniformity of Results: (If More Than One Wheel Tested)
Remarks:

Recommendations for Additional Tests:
Action Taken:

**Above is a copy of the set-up sheet used by methods department of Cleveland Twist Drill for establishment of grinding times and standards.**

**Left is a copy of the record kept on all wheel tests made at Cleveland Twist Drill. Note the completeness of this form.**

experience and the advice of grinding wheel manufacturers. Wheels of generally three specifications are then purchased on a trial basis.

When the machine is installed and the testing starts, the engineer or technician actually operates the machine, thus providing correct judgment of the grinding conditions. The wheel specialist is present at these tests to observe the actual grinding action of the abrasive. All information is recorded. It is sometimes necessary to order additional specifications based on information gathered during the initial trial. When both the correct wheel and the proper grinding method have been established, job standards are written and the machine is turned over to Production.

A satisfactory trial wheel is always re-ordered for a check test. When a new grinding wheel specification is confirmed, notification is given to the Purchasing Department. Purchasing buys only to the exact specifications and drawings supplied by the Methods Department. For grinding wheels, at least two suppliers are chosen for each requirement and orders are placed as required.

Since his appointment as Abrasive Specialist, J. L. Cognata has developed a few basic ideas that have made him an effective part of this program, namely: (1) every trial wheel should be viewed with the attitude that it will be the correct one for the job; (2) each job is treated individually; (3) the grinding wheel and coolant should be selected for a specific operation, and no sacrifice should be made on a near-similar operation for the sake of standardization alone; (4) every grinding wheel,

Above is a typical scene in the day of the abrasive specialist as he attempts to gain all information possible from abrasive engineers of the supplier companies. This close cooperation is considered most important in obtaining the greatest benefits from the abrasive operations.

coolant or wheel dresser now in use is not necessarily the best possible one for the operation. They are, therefore, always open for competitive tests with new products. Many changes in wheel specifications at Cleveland Twist Drill confirm this, while it also suggests that each grinding wheel representative who calls knows his product and its application; (5) every high-production job should be continually tested whenever possible.

Communications are one of the abrasive specialist's biggest jobs. As stated before, he is required to forward grinding information to the many Production Department Managers so that each may benefit from the experience of others. Formerly, each department manager served as his own abrasive specialist. Each had his own concepts on which he relied to solve his abrasive problems. These conditions led to added cost from the confusion and waste. Visual aids are often used to provide additional education for department managers.

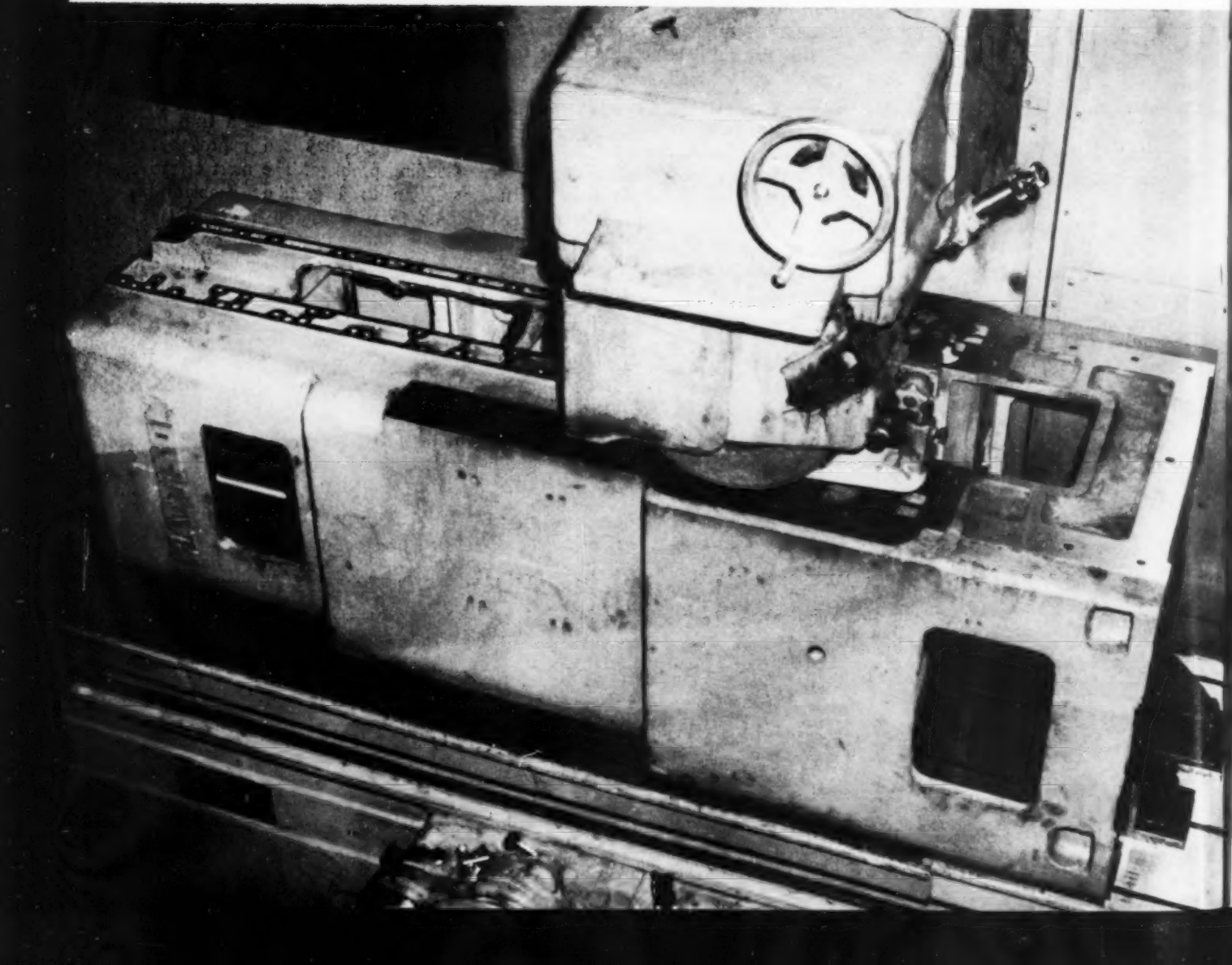
When new engineers or technicians join the Methods Department, the abrasive specialist spends one or two days with these men. During this time he tries to take the mystery out of grinding and provide a firm base from which they can approach the grinding problem. The most effective solution to a grinding problem results from a thorough diagnosis of the problem. In grinding operations, the machine, wheel, coolant and dressing must all be considered in this solution. • • •

**J. L. Cognata, abrasive specialist, spends a great deal of his time on the dissemination of grinding information. Each new man in the methods department spends one to two days with Cognata who briefs him on the basic information.**

# Why Surface Grinding is replacing C

By ARTHUR M. MATTISON
Chief Engineer
Mattison Machine Works

High powered surface grinding has made possible savings which cannot be overlooked by management and method engineers. Many cutter-type operations are extremely costly in comparison to surface grinding.



# Cutter -Type Machining

● High-powered surface grinders, because of developments in grinding wheels and the inherent cost advantages, are taking over stock-removal operations. Materials, hardness, accuracy and finish, once the criteria for grinding, are no longer the only factors to be considered. Surface grinding should be compared cost-wise with other methods of flat machining before part specifications and design are finalized.

Let's then pose these questions: Why is big money being wasted in overmachining? Why are excessive stock allowances for cutting the hard outer scale increasing your piecepart costs? Why is surface grinding faster than cutter-type machining on many jobs? Why is the real cost of grinding wheels lower than the real cost of cutting tools? Why do surface grinders give you more productive minutes out of every hour than most cutter-type machine tools?

If you know the answers, fine. But more important, do you realize that they are all true and that you can be benefiting from them? These questions concern production, material waste and tool costs, and to them should be added improvements to your product. Easier, faster assembly and servicing, longer service life, easier break-in, reduced cost of maintenance, higher quality and greater salability are the additional benefits.

Without their knowing it, grinding decisions are being made by design engineers, patternmakers, suppliers or buyers of castings, shop foremen and others. These decisions are made without consideration for tool versus wheel costs, machining time, lower material costs and lower fixturing costs.

Let's look at tool versus wheel costs first. Wheel change costs are less. Wheels can be self-dressing. No downtime is required for replacing dull tools. Downtime for replacement of broken tools is eliminated. Equipped with automatic sizing, surface grinding continuously compensates for wheel wear and there is no need for manual adjustment. No downtime is required for resetting the machine during the production run as with cutters which require resetting in the machine after resharpening.

Wheel inventory is lower. Wheel life is predictable, breakage is rare, so only wheels for replacement need be held in inventory. No need to duplicate wheels in the tool crib or sharpening room. Wheels are more standard in shape and a limited number will fit a variety of part sizes.

Wheel depreciation costs are lower. Improved bonds are providing more economical wheel breakdown at higher rates of production. Ruining and overdulling of cutter blades is eliminated. Hard spots, tough outer scale and burned edges are no problem for the new grinding wheels. Wear is controlled, and once proper downfeed, grinding fluid and wheel specifications are established, human judgments affecting wheel costs are minimized.

Wheel sharpening costs are much less. Wheels are sharpened easily and quickly with a dresser on the machine, no other machines or labor are needed to service the tool. Wheels are often self-sharpening after the initial dressing.

Grinding machining times are less than cutter-type tooling. Stock removal rates on high-powered surface grinders have doubled and in some cases tripled over the past ten years due to increased horsepower, grinding wheel improvement, machine design, machine rigidity improvement and increased downfeed.

Faster loading and unloading greatly reduce the machining time. Grinding pressures are much less and spread over a larger area thus reducing shift or spring of the part. Practically no clamping pressures are required. There is no "lifting" of the work from the table.

Lower material costs result from grinding particularly in high production and when castings are bought by the pound. There is no need to "pad" stock allowances for cutting under the scale. Wall sections can be

**Typical example of how a casting design has been changed so that the bossed area of the part is relieved in the areas not required, thus allowing a better grinding surface on a part formerly planned.**

Meehanite hopper tables-- grinding 375% faster than planing. Stock removal is 1/4 inch on four sides at rate of 8.6 cu in. per minute.

SAVINGS = $14.93 PER PIECE

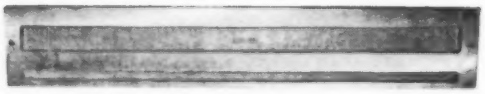
| Machine | Planer | No. 400 Grinder | Net Saving |
|---|---|---|---|
| PRODUCTION RATE Pieces per hour | .56 | 2.1 | |
| (1) MACHINING COST Per Piece Machining time x (labor + overhead) = (min) x ($ per min) | $9.33 | $2.31 | $ 7.02 |
| (2) TOOL OR WHEEL REPLACEMENT COST Per Piece | | | |
| (a) Tool or wheel change cost | $ .40 | $ .00 | |
| (b) Tool or wheel depreciation cost | .35 | .30 | |
| (c) Tool or wheel sharpening cost | .25 | .01 | |
| | $1.00 | $ .31 | $ .69 |
| (3) NONPRODUCTIVE COST Per Piece | | | |
| (a) Setup cost | $6.70 | $1.07 | |
| (b) Loading & unloading cost | 2.84 | 1.25 | |
| | $9.54 | $2.32 | $7.22 |
| TOTAL MACHINING COST Per Piece = (1) + (2) + (3) | $19.87 | $4.94 | $14.93 |

Finish after grinding-- 40 rms; after milling-- 125 rms. Wheel wear ratio -- 40:1.

**(left) Cost comparison of planing and surface grinding Meehanite cast hopper tables. Total savings $14.93.**

**(center) Cost comparison of vertical milling and surface grinding cast iron roll housing. Total savings $1.20.**

**(right) Cost comparison of vertical milling and surface grinding Meehanite chain block. Total savings $.19.**



thinner. Grinding ease removes stock from thin sections without breakage or springing.

Lower fixture costs are provided as there are little or no clamping pressure requirements. Magnetic chucks eliminate the need for set-up tables and increase the range of work which can be handled without set-up changes. Modification of fixtures or new fixturing is eliminated. Lead time for new products is greatly reduced as special cutter and fixture requirements are minimized.

Inspection and quality control of parts can be reduced. Less distortion of the part while grinding increases the accuracy of the operation. Gaging on dial settings on surface grinders is more accurate thus reducing time for gaging. Ordinary tolerance limits are easy to meet without special operator skills or accurate tooling.

Product value is greatly increased by grinding. Sales appeal is increased by the improved finish and greater accuracy. The better fit of the parts saves assembly time while increasing the product value. Deburring and finishing can be eliminated and time can be saved by working from more accurate surfaces.

To obtain these advantages surface grinding has developed in two basic areas; grinding wheel improvements and machine developments in the form of higher horsepower and rigidity.

Improved bonds are now stronger, thus resist heavier grinding forces of compression, shear and impact. These bonds now allow the use of coarser grit with more open structure. This in turn means larger chips with less

Grinding cast iron roll housing results in 160% production increase over vertical milling. Stock removal is .150 inch.

SAVINGS = $1.20 PER PIECE

| Machine | Vertical Mill | No. 400 Grinder | Net $ Savings |
|---|---|---|---|
| PRODUCTION RATE Pieces Per Hour | 5 | 6 | |
| (1) MACHINING COST Per Piece Machining time x (labor + overhead) = (min) x ($ per min) | $ .75 | $ .25 | $ .50 |
| (2) TOOL OR WHEEL REPLACEMENT COST Per Piece | | | |
| (a) Tool or wheel change cost | $ .01 | $ .00 | |
| (b) Tool or wheel depreciation cost | .06 | .03 | |
| (c) Tool or wheel sharpening cost | .04 | .00 | |
| | $ .11 | $ .03 | .08 |
| (3) NONPRODUCTIVE COST Per Piece | | | |
| (a) Setup cost | $ .75 | $ .19 | |
| (b) Loading & unloading cost | .75 | .69 | |
| | $1.50 | $ .88 | .62 |
| TOTAL MACHINING COST Per Piece = (1) + (2) + (3) | $2.36 | $1.16 | $1.20 |

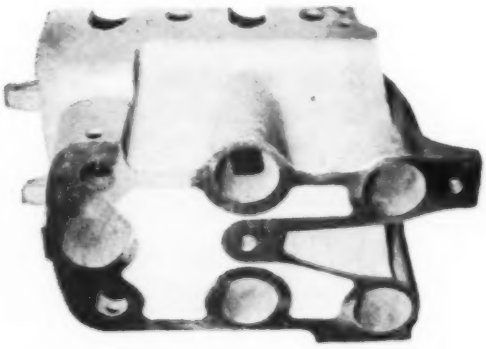
Finish improves from 125 to 42 rms. Accuracy after grinding: ± .001 inch; after milling: ± .005 inch. Grinding flatness-- .0002 TIR; milled flatness-- .002 TIR.

Grinding Meehanite chain block increases production 200% over vertical milling. Stock removal is .150 inch.

SAVINGS = $.19 PER PIECE

| Machine | Vertical Mill | No. 400 Grinder | Net $ Savings |
|---|---|---|---|
| PRODUCTION RATE Pieces per hour | 33 | 68 | |
| (1) MACHINING COST Per Piece Machining time x (labor + overhead) = (min) x ($ per min) | $ .23 | $ .05 | .18 |
| (2) TOOL OR WHEEL REPLACEMENT COST Per Piece | | | |
| (a) Tool or wheel change cost | $ .00 | $ .00 | |
| (b) Tool or wheel depreciation cost | .00 | .00 | |
| (c) Tool or wheel sharpening cost | .01 | .00 | |
| | $ .01 | $ .00 | .01 |
| (3) NONPRODUCTIVE COST Per Piece | | | |
| (a) Setup cost | $ .11 | $ .11 | |
| (b) Loading & unloading cost | .00 | .00 | |
| | $ .11 | $ .11 | .00 |
| TOTAL MACHINING COST Per Piece = (1) + (2) + (3) | $ .35 | $ .16 | .19 |

Grinding finish-- 32 microinches. Milling finish-- 125 microinches. Truer flatness achieved through grinding, from .005 TIR to .001 TIR, makes it easier to maintain tolerances on subsequent operations. Wheel wear ratio-- 18:1.



loading and greater stock removal. New bonds have provided freer cutting, greater grinding ratio, more uniformity and allowed greater horsepower to be used.

Grain has been improved both in shape and strength. Individual crystals having numerous sharp points do not require crushing and thus have fewer dull edges, stronger bonding characteristics and fracture to present sharp edges instead of pulling out whole when dull.

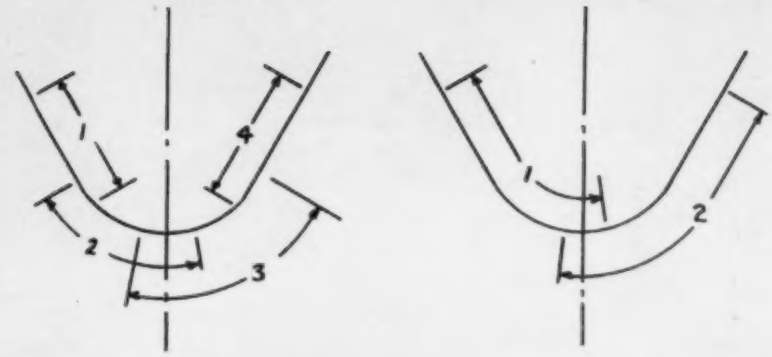
Machines with higher horsepower are now able to put up to 125 hp on a 20″ wheel, keeping hard, tough wheels self-dressing for heavy stock removal. For harder wheels, the spindle can be tilted to reduce the number of grains in contact with the work and boost stock removal without increasing wheel cost.

To increase penetration for large uninterrupted surfaces and take advantage of hard tough wheels, feed rates have been increased and feed stops lengthened from .025″ to .240″.

Construction of the machines, in the areas of castings and design, provide rigidity to eliminate deflection and vibration under high feeds.

To take advantage of the inherent economies in surface grinding, first emphasize the importance of understanding and cooperation of methods engineering, design, purchasing, sales, shop and foundry personnel. Next, select the toughest flat machining job or one with high cost and send a part to the machine manufacturer for a test report.

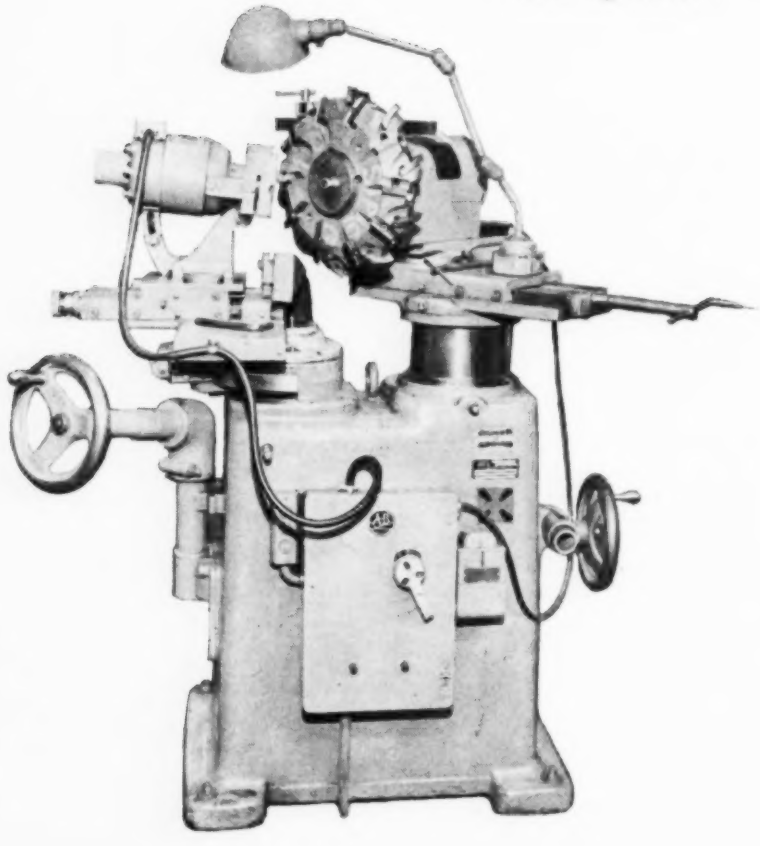
These steps will prove that surface grinding will reduce unit costs, increase return on capital investment and upgrade product quality. • • •




These drawings illustrate the two passes or motions of the Arc Radius grinder as compared to the four passes of other set-ups.

# A cutter grinding problem solved at Caterpillar

**Consisting of left and right hand sections, the cutter required grinding of straight and radius blades with negative and positive rake angles. These are the unique sharpening problems presented by Caterpillar's interlocking cutter.**



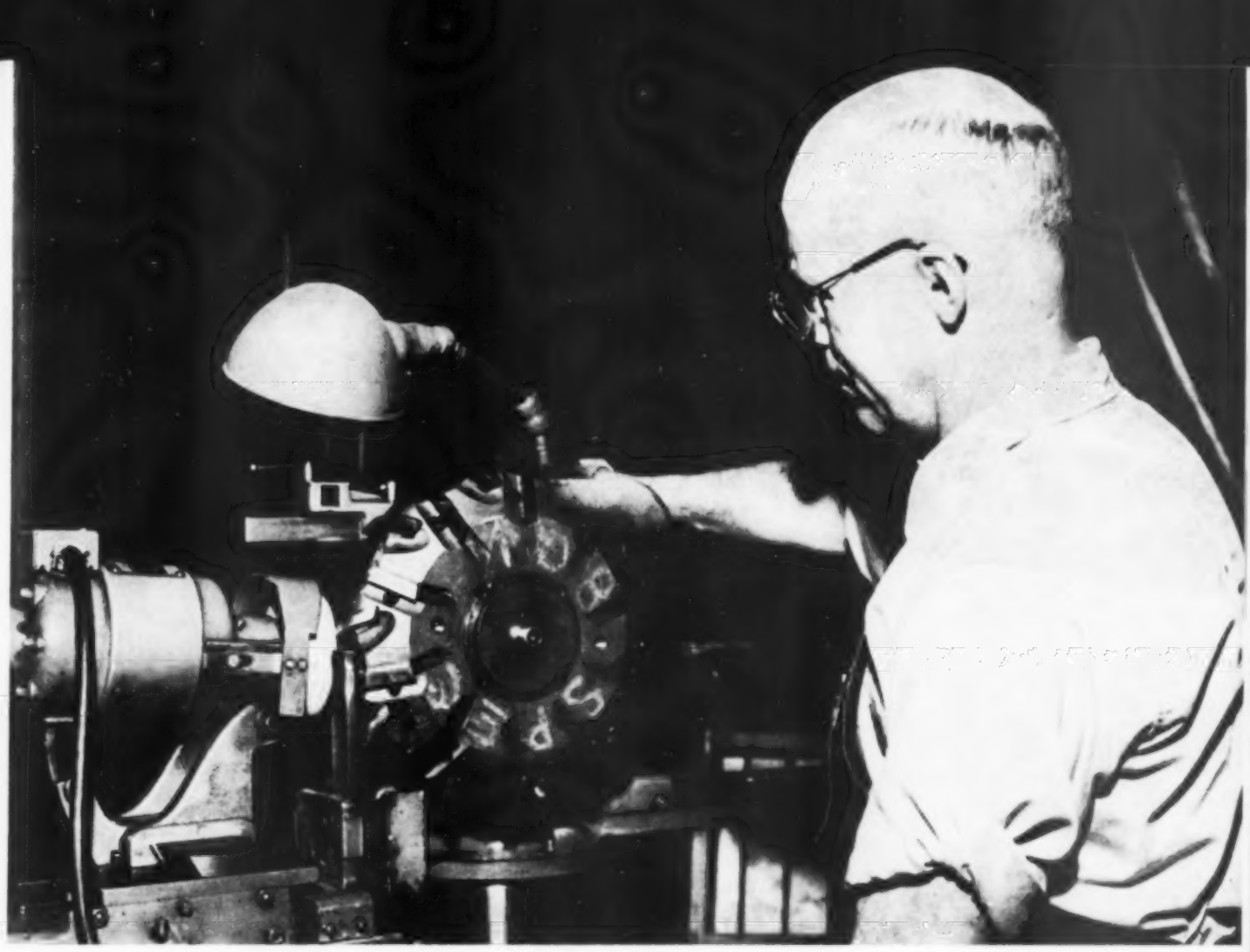
Above is the Oliver No. 2 Arc Radius Grinder used by Caterpillar in the solution of the grinding problem on an interlocking cutter.

By M. M. PATTERSON
Editor

● The problem was to grind straight and radius blades with negative and positive rake angles on the left and right hand sections of an interlocking cutter. This cutter is used by Caterpillar Tractor Co., Peoria, Illinois, to mill a female form on a part manufactured for the Crawler Tractor. The problem was further complicated by the usual requirements of radius blending, accuracy and production.

This is the problem which was presented to Oliver Instrument Company, Adrian, Michigan. One of the cutters was sent with the problem and the solution was started.

First the Oliver people checked the condition of the cutter as it would normally come to the grinding operation. Both left and right hand sections contained ten straight teeth and ten radius teeth which required primary and secondary grinding. Before grinding, an indicator check of the blend between the radius blades and the straight portion of the blades revealed total discrepancy of approximately .004" on one section and approxi-



**This is the set-up used at Caterpillar for grinding one half of the cutter used to mill a female form on a part for the Crawler Tractor.**

mately .0045″ on the other. They believed this resulted from grinding the radius blades and straight blades in separate setups.

The sections of the cutter were then ground separately on an Oliver No. 2 Arc Radius Grinder. The primary grind was made first followed by the secondary. Subsequently, it was recommended that this procedure be reversed in order to grind the large stock removal operation first. After the grinding operations were completed, the sections were again checked by the same method used originally. This first grinding pass resulted in an error of .0015″ between the straight and radius blades. However, for both sections, the radius teeth were identical as were the straight teeth. Further investigation revealed that the teeth were not resting on the finger correctly. With two opposite rake angles, the teeth would rest on either one corner of the finger or the other. To relieve this situation, design of the finger was altered so that the teeth rested on flats of the finger. (Figure 1)

By traversing the straight tooth and then the radius tooth as though it was one continuous motion, the problem of radius blend has been greatly reduced. Only one movement is required per section. (Figure 2) This blend should be measured on the outside diameter of the teeth. Only one problem remained and this was that the diameter of the left and right sections should be equal. Solution was provided by using a large micrometer.

Two machines were recommended to provide the production required. One machine was set-up for left hand sections and the other for right hand sections. Grinding time with the two machines is approximately 1-1/2 hours. Setup per cutter is only a matter of 10 minutes, consisting of bolting the cutter section on the machine and adjusting for any change in the diameter of the cutter. Checking the run-out of the twenty cutter blades per section requires not more than two to three minutes with the indicator mounted to the machine. • • •

**Drawings show how original finger rest was not designed for both left and right sections of the interlocking cutter (top two drawings). Bottom drawing shows the corrected design.**

# Standard Marking System

C 36 L 5 V

## What you should know about GRAIN TYPES

Aluminum Oxide
Silicon Carbide

By RICHARD L. McKEE
Managing Editor

● The system of standard markings is a sort of shorthand code for expressing the composition of a grinding wheel.

Users who know what the markings mean and can read them readily are in a better position to understand the abrasive tools with which they work and to make intelligent comparisons between wheels.

### PURPOSE AND SCOPE OF MARKINGS

Markings contain symbols for five standard characteristics—grain or abrasive type, grain size, grade, structure, and bond type. Structure is sometimes omitted, while a manufacturer's symbol may precede the abrasive type symbol, and/or follow the bond symbol.

Symbols are always arranged in the same sequence. The groupings are not necessarily standard. For instance, below are two typical markings, with the standard symbols in bold-face type and breaks shown by dashes:

**A 36—O 5 V** G

(This represents a regular aluminum oxide wheel (A), grain size 36, O grade, 5 structure, in a vitrified (V) bond which this manufacturer further designates by the symbol G.)

9 **A—46 J 12—V** 22

(This is a friable—manufacturer's symbol 9—aluminum oxide wheel, 46 grit, J grade, 12 structure, in the vitrified bond which this company designates as 22.)

Each of these five major symbols will be the subject of an article in this series. This first one concerns grain or abrasive type.

### GRAIN OR ABRASIVE TYPE

The first major symbol of the marking, reading from left, is a letter indicating the kind or type of abrasive material. This letter may or may not be preceded by other numbers or letters to pinpoint more closely the nature of the abrasive.

The symbol for aluminum oxide is A; for silicon carbide, C. These are the two high-volume manufactured abrasives from which most abrasive wheels are manufactured. Corundum, a natural aluminum oxide, is used to a minor degree in wheels, not sufficiently to have an agreed-upon symbol. Designations for the various groupings of these three abrasives are included in Table A.

This table is based upon material not generally available, from manufacturers of bonded abrasives in the United States. It should be pointed out that these groupings are not sharply defined. What one manufacturer considers as semifriable aluminum oxide, for instance, may not be precisely what another lists in the same column. Broadly speaking, they have been agreed upon as similar, and for practical purposes may be so regarded.

### ALUMINUM OXIDE

Most aluminum oxide is made by refining and fusing bauxite ores in a pot-type electric furnace. Dried bauxite is mixed with small amounts of coke and iron borings to make up charges on the order of five tons each.

The mixture is heated to a range of 3500° to 4000°, fused, and cooled. The resulting rock-like "pig" is then crushed and screened into the various grain sizes. The degree of refinement determines the percentage of impurities, and hence toughness of the grain. The crushing helps determine grain

**This is the first article of five on the standard marking system which will appear monthly from this issue until June, 1961. Succeeding articles will discuss grain size, wheel grade, structure, and bond types. Reprints of the complete series will be available about July 1. Tear sheets of individual articles will be available as long as the supply lasts.**

## COMPARATIVE DESIGNATIONS OF ABRASIVE GRAIN TYPES USED IN GRINDING WHEEL MANUFACTURE

Table A[2]

| MANUFACTURER | ALUMINUM OXIDE | | | | | | | SILICON CARBIDE | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HEAVY DUTY | REGULAR | SEMI-FRIABLE | FRIABLE WHITE | CORUNDUM (Natural) | MIXTURE OF AL. OX. | MIX-OF AL. OX. & S.C. | HEAVY DUTY | REGULAR | SEMI-FRIABLE | FRIABLE GREEN | MIX OF S.C. |
| Acme | RA DA | A UA | FA | — | — | WA | CA C1A C2A C3A C4A | — | C | — | — | — |
| Allison-Campbell | — | A | DA | WA | — | XA VA | — | — | C | — | GC | — |
| American Emery | RA | A | 29AA 22A | 77A 11A | — | MA | CA | C | C | FC | GC | AC |
| Atlantic | — | A | — | — | — | — | — | — | C | — | GC | — |
| Bay State | HA RA | A | 3A | 7A 9A | 4A | 8A 2A SA | CA MA | 7C | C | — | 1C | 3C |
| Bullard | 3A | A | FA | WA | — | 6A | CA | — | C | FC | — | 6C |
| Carborundum | WA | A TA | GA SA | AA | — | DA FA HA | C3A C4A | WC TC | C | BC SC | GC | RC |
| Chicago | — | A 51 | SA 52 54 | 53 55 | — | 50 | — | — | C 49 | — | GC | — |
| Cincinnati | 1A | A | 2A 4A | 9A | — | 97A | CA C2A C4A | — | 6C | — | 5C | 7C |
| Colonial | EDA | A | TA NA | 20A | — | 5A 10A 15A 5TA 10TA 15TA | 5TAC 10TAC 5CTA 10CTA | C | C | — | GC | — |
| Cortland | SA | A | FA BA | WA | — | GA EA DA | CA | SC | C | — | GC | MC |
| de Sanno | A | A AT | 7A 7AT | 9A 10A RG | — | 97A JA KA KTA SA | CA DA FA GA | — | C | — | GC | — |
| Eagle | DA | A | TA | 66A 62A | — | 22A 33A | 44 | — | 88C | — | GC | — |
| Electro | 10A RA | A EA | 5A 11A FA | 1A | — | 2A 3A 4A 6A 8A 9A 12A | CA DA 7A BA | — | C | — | GC | HC |
| Fuller | — | A | FA JA | BA | D | HA | CA | — | C | — | GC | RC |
| Gardner | — | A 84A 87A | 82A | 80A | — | 81A 83A 85A 86A 88A | — | — | C | — | GC | AC |
| General Grinding | 3A TA | A | 2A 4A | 10A | 3 | HA KA | RA EA | — | C | — | 7C | BC |
| Hampden | TA GA SA | FA | EA | WA | C | — | CA | C | — | — | GC | — |
| Jowitt & Rodgers | — | G | B | W | — | — | — | — | X | — | GC | — |
| Keystone | ZA | A | FA JA | WA | GA | LA HA RA | — | — | C | — | GC | — |
| Macklin | — | A | 29 27 | 48 | 31 | 18 | AC | — | C | — | GC | HC |
| Manhattan | LF | F | W | — | — | FW | FS & Q | — | G | — | G | GS |
| Mid West | 5A | 1A A | 8A 11A | 2A | 6 | 4A S11A | AC | C | 3C | — | 7C | 3C |
| National | — | A | PA HA BA | SA | — | MA | CA | — | C | — | GC | AC |
| Norton | 44A 75A | A | 57A 23A | 32A 38A | — | 19A | AC A1C A2C A3C | — | 37C | — | 39C | — |
| Pacific | 25 | A | 35 | 50 47 | — | 40 45 | 70 | — | 75 | — | 80 | — |
| Peninsular | 4A | A | FA BA | SA | NA | WA RA | CA | — | C | — | GC | GC/C |
| Precision | MA | A TA | FA FAA FRA GA | AA RAA | NA | — | CA FCA | — | C | BC | DC | — |
| Red Hill | — | A | FA | WA | — | HA | AC | — | C | — | GC | — |
| Robertson | SA | FA HA | RA LA | WA | — | — | BA | C | JC | — | GC | — |
| Simonds Abrasive | DA | A | JA XA | WA SA | — | NA | BA | SC | C | — | GC | — |
| Simonds Worden | 4A | A | 5A 7A | 8A | — | 6A 9A | AC | — | C | — | GC | CGC |
| Sterling | HA | A | KA PA | WA | XA | ZA EA | JA | C | C | C | GC | SC |
| Titan | AL | AL | FA BA | WA | — | WFA WBA BFA | AC | C | C | — | GC | C |
| U.S. Rubber | DA KA | A | BA | WA | — | A4A B4A C4A D4A W4A | S4A E4A F4A 81A | — | C | — | — | — |
| Vitrified | — | A | 8A | 9A 13A | — | 6A 8A | 7A | — | C | — | GC | HC |
| Waltham | A | A | 68A | WA 11A 12A | — | 14A 34A SA | CA 16A | C | C | — | GC | MC |
| Westfield | — | A | FA 77A | 75A | — | 72A 73A 74A | CA 76A | — | C | — | GC | — |

shape, and hence, also effects grain toughness.

Friable aluminum oxide, usually white, is refined from high-purity alumina ore without any additions.

Unfused aluminum oxide is also manufactured for specialized uses. This is not necessarily specially designated within the lists in Table A.

There are four recognized sub-types of manufactured aluminum oxide—friable, semi-friable, regular, and heavy-duty. These broadly reflect the degree of toughness, or conversely, of friability, of the grain.

**Friable Aluminum Oxide**

Friable aluminum oxide (at least 99½% $Al_2O_3$) is the purest form of the material, familiar as the "white wheel" in many toolrooms throughout the country.

These are cool cutting wheels. The grain breaks down readily, constantly presenting fresh, sharp points to the work. There is little or no rubbing of dull grain to generate heat.

**Other Fused Aluminum Oxides**

Semi-friable (96%-97½% $Al_2O_3$) and regular (94%-95½% $Al_2O_3$) probably make up the large proportion of aluminum oxide for grinding ferrous metals on, for instance, cylindrical, centerless, and portable grinders. Heavy-duty aluminum oxides are generally limited to snagging operations.

Generalizing about applications is dangerous, because other factors than friability resulting from the chemical composition of the grain can affect the wheel action. The shape of the grain, which reflects the nature and sequence of operations which follow furnacing, also affects the toughness of the grain.

As a recent article in **Grinding and Finishing** says:

"Roll crushing provides a sharp grain of less regular appearance which has the lowest toughness. By means of mulling, the most cubical, regular shape can be obtained and such grain will be the toughest.

"The effect of shape can be attributed at least in part, to the cross section of the grain which must be fractured for breakdown. The more regular in shape, the larger is the cross section through possible planes of fracture.

"The toughness of aluminum oxide abrasive grain can be enhanced by roasting the grain after it has been crushed to size. This process is merely one of heating the grain to a predetermined temperature for a well-defined period of time. Within limits, the time and temperature used control the final toughness of the grain."[3]

## SILICON CARBIDE

Pure white quartz sand and fine coke are synthesized with relatively small amounts of sawdust and salt in a huge, trough-like furnace to make silicon carbide. Furnace temperatures run over 4000°F.

The abrasive is formed in a sort of flattened tube. After the fire-sand (partly-converted silicon carbide) has been scraped off, the abrasive is broken up into large chunks for crushing and grading to size.

**Variations of Silicon Carbide**

This abrasive is generally considered to consist of two sub-types, friable (green) and regular (black) silicon carbide, though more sub-groups are shown in Table A. A number of companies use the same symbol for heavy-duty and regular abrasive.

Again, the difference lies in the purity of the product. Green silicon carbide is the purer of the two, more friable, and generally considered harder. Its applications lie mainly in the grinding of tungsten carbides and other very hard substances.

Regular silicon carbide has found applications in the grinding of nonferrous materials which are relatively soft, and in ceramics and other nonmetallics, which are relatively hard. This is a paradox beyond the province of this discussion.

## WHEEL COLOR

Silicon carbide grinding wheels tend to continue the blue-black or green color of the original grain. Aluminum oxide runs in a range from white through tans, pink, blue-gray, and darker browns and grays in vitrified bonds; they tend to dark gray approaching black in most resinoid.

All this has nothing to do with the wheel's grinding action, as has been mentioned before. It is understandable that a user who has gotten good results from, say, a gray wheel from a given company will continue to use it. But this is not guarantee that a tan wheel from the same company, or from another, might not do a better job.

Grinding wheel manufacturers go to great pains to duplicate colors for particular wheels. This is one means of identification. But they have gone to far greater lengths to develop a more positive method of identification in the standard marking system.

## SUMMARY

The user who can read the code is on his way to a better understanding of the abrasives with which he works. He is also in much better position to discuss his needs and his problems with suppliers and other users. And while there are obviously many things which the markings cannot tell, they can reveal many facts of interest and benefit to anyone who knows how to interpret them. • • •

**The introduction to the American Standard Markings for Identifying Grinding Wheels and Other Bonded Abrasives, ASA B5.17-1958 (its official title) explains its purpose and scope as follows:**

**"This standard applies to grinding wheels and other bonded abrasives: segments, bricks, sticks, hones, rubs, and other shapes . . .**

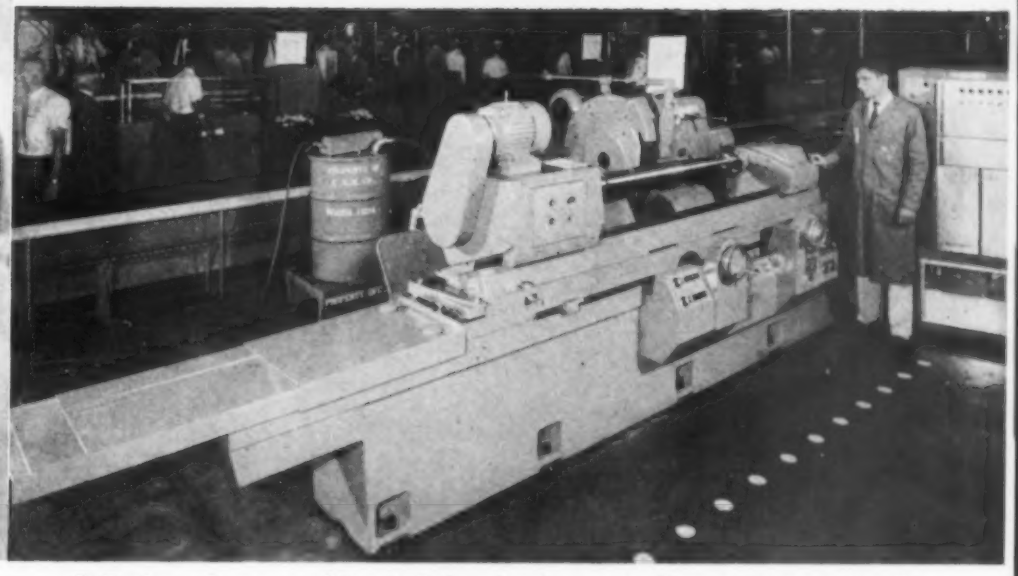
**"The standard does not apply to diamond wheels or to specialties such as sharpening stones . . .**

**"This is a standard system of markings only. Wheels bearing the same standard markings if made by different wheel manufacturers may not and probably will not produce the same grinding action. This desirable result cannot be accomplished because of the impossibility of correlating any measurable physical properties of bonded abrasive products in terms of their grinding action."[1]**

## REFERENCES

1. Extracted from American Standard Markings for Identifying Grinding Wheels and Other Bonded Abrasives (ASA B5.17-1958), with the permission of the publisher, The American Society of Mechanical Engineers, 29 W. 39th Street, New York 18, New York.
2. Table A is based upon information supplied by the Grinding Wheel Institute, member companies, and other grinding wheel manufacturers. Format for the chart suggested by Simonds Abrasive Company.
3. "Grit Hardness and Toughness," GRINDING and FINISHING, November, 1960, p. 39.

Cincinnati 18″ x 72″ Numerically Controlled Plain Grinding Machine includes convenient, functional arrangement of the cross feed and table traverse handwheels, control levers and electrical control buttons.



Full view of new machine includes the Acramatic Numerical Control unit. This unit is a 2-axis rate controlled positioning type. Sequence and type of operation to be performed, table reversal points, table and wheelhead movement, truing of predetermined amount and cycle stops are programmed.

# Numerical Control comes to Cylindrical Grinding

At the recent Machine Tool Exposition, several cylindrical grinders with numerical control were displayed. These machines provide the inherent advantages of centertype grinding with the increased advantage of numerical control. We have selected Cincinnati's 18″ x 72″ for your first review and others will follow.

By M. M. PATTERSON
Editor

● Reduction of floor to floor costs on large multiple diameter shafts is now accomplished through the use of the Cincinnati Numerically Controlled Grinding Machines. Set-up, control, accuracy, repeatability, and simplicity have been the objectives of improvement on virtually every machining operation. All these are improved by the use of numerical control on cylindrical grinders.

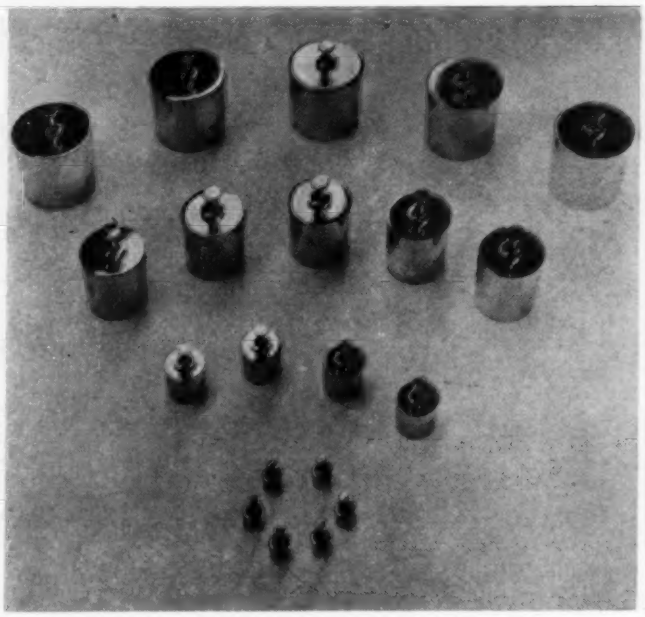
Cincinnati's 18″ x 72″ machine with Acramatic (2-axis) numerical control system is a completely new machine. For the 18″ swing and 72″ maximum length capacity, the machine is powered with 2 hp headstock motor and 20 hp grinding wheel drive motor. Wheel head and table are driven by electro-hydraulic servo controls to provide highly responsive, precise movements. A complete complement of manual controls are provided in addition to the automatic. Also included in the design is Cincinnati's Filmatic spindle bearing and automatic grinding wheel balancing.

Typical of the jobs which can be performed on this machine is the 100 hp motor armature shaft on which ten diameters are ground. These diameters range from 5″ to 2-3/8″ and are held to within .0006″ to .001″. The length of this part is 54-1/2″. The diameters are automatically rough and finish ground. Diameter to diameter set-up is controlled automatically as is dressing, traverse, and infeed. Both plunge and traverse grinding operations are numerically controlled.

To eliminate the possibility of taper caused by thermal distortion, both the hydraulic and coolant units have been isolated from the machine bed. The headstock has been designed to place the centerline of the spindle directly over the centerline of the table vee-way.

In addition to reducing set-up time, the Acramatic 2-Axis Rate Controlled Positioning system provides flexibility of operation which cannot be obtained with standard machines. Each tape can be programmed to follow the fastest sequence of operations, yet if desired, the operator can perform a manual operation at any point in the operational sequence without modification of the tape. On a single part, the machine can still be operated as a standard cylindrical grinding machine.

• • •



The Packer Buffing Machine buffs all seven sizes of Fisher weights, from the tiny 1-gram weight seen here in the circle to the big 100-gram weights in the back row. Three interchangeable spindles do the trick.

# Weight-Buffing: A precision operation

The Problem: how to increase speed and efficiency of a weight buffing operation, and improve quality. The Solution: a specially-designed automatic buffing machine.

**Special to GRINDING and FINISHING**

● Fisher Scientific Company manufactures weights with extreme care and precision. The final, and most crucial, machining operation is buffing. In the past, this operation has been one of the slowest and has relied on the accuracy of the individual operator. It is now performed on an automatic machine raising the production from 25 to 30 per day from two men, to 500 per day from one man. Constant high quality is assured.

Fisher Perma Weights are precision equipment, accurately made of a permanent-mass, non-magnetic stainless steel alloy to meet the new group and individual weight tolerances established by the National Bureau of Standards. The unbuffed weights, after they have been cut and formed, look smooth and finished to the eye. Under magnification, however, the weights' surface is rough and full of pits. These tiny holes can collect dust particles, or oil from fingertips, which make sensitive weights false and inaccurate by the extra weight. Thus, the weights are buffed and polished to a mirror-bright smoothness to remove all dust-catching pits.

The unbuffed weights are actually two parts and weigh less than the final products. The handle, or top and bottom, or base, are mounted together for the buffing operation. They are weighed together prior to buffing. The buffing is a standard preset operation, which removes less than .001″ of stock. Following the buffing, the weights are weighed again and tin is added in a well under the handle. This operation is done in a dust proof, temperature controlled room. The balance used is sealed.

After the buffing operation and prior to final weighing, the weights are inspected visually under a microscope to detect any irregularities.

The Packer Machine Company's special automatic buffing machine consists of a large turn-table, with 24 spindles located around the edge of the table. The weights are placed in holders on the top of each spindle, and as the table rotates the spindles rotate also, and the rotating weights are carried under the rotating buffing wheels (the buffing compound is fed automatically onto the wheels), and then under one coloring wheel, which is also automatically fed with coloring compound.

When the spindle returns to where the operator is standing, it ceases to rotate. This allows the operator to remove the finished weight and replace it with another to be buffed.

**Here the operator starts the motors to check results and make any needed adjustments in speed or pressure. Gleaming in the left foreground are three rows of freshly-buffed 20-gram weights.**

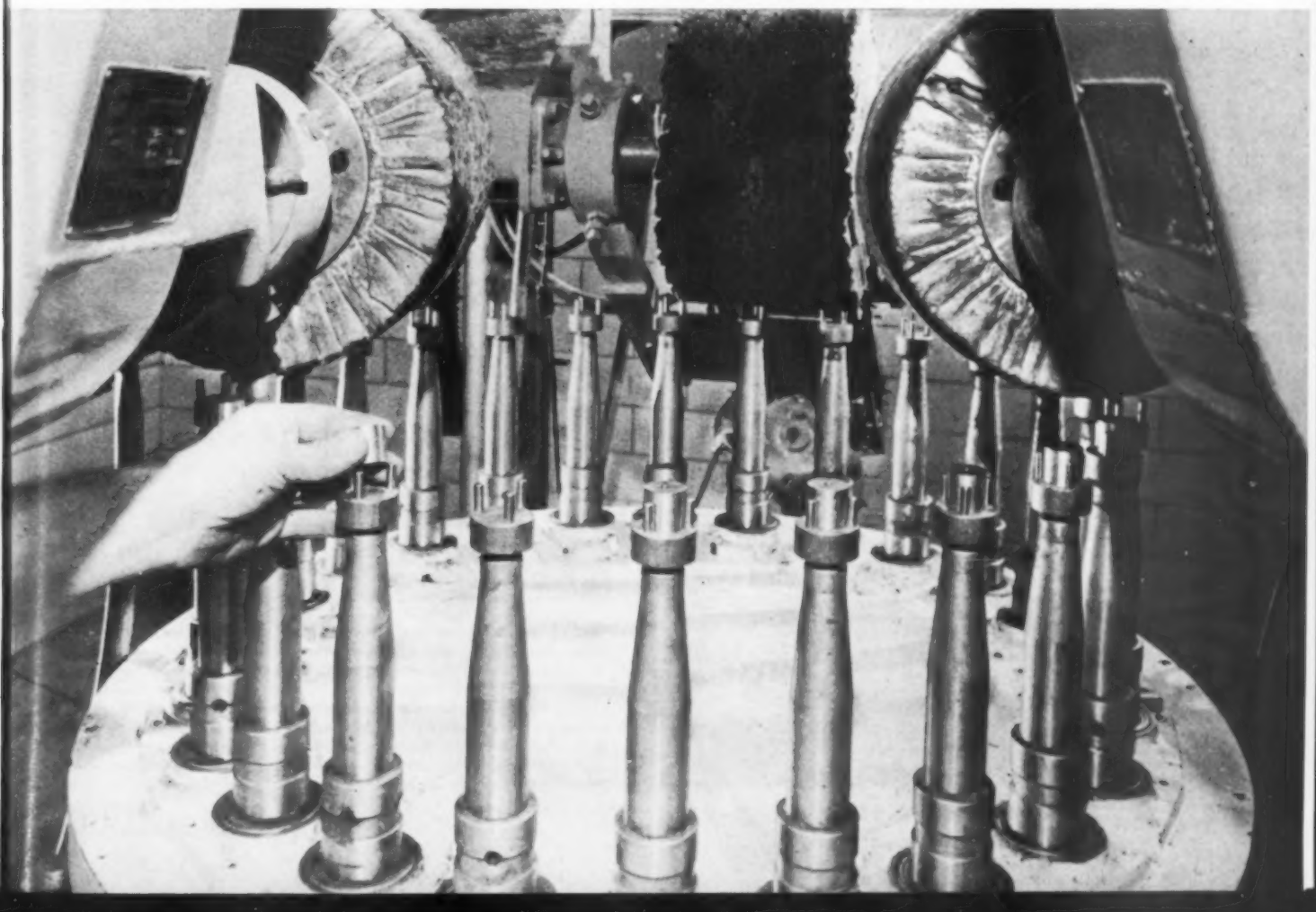
**The operator watches closely as the coloring wheel is automatically moved into position over the weights sitting atop the spindles.**

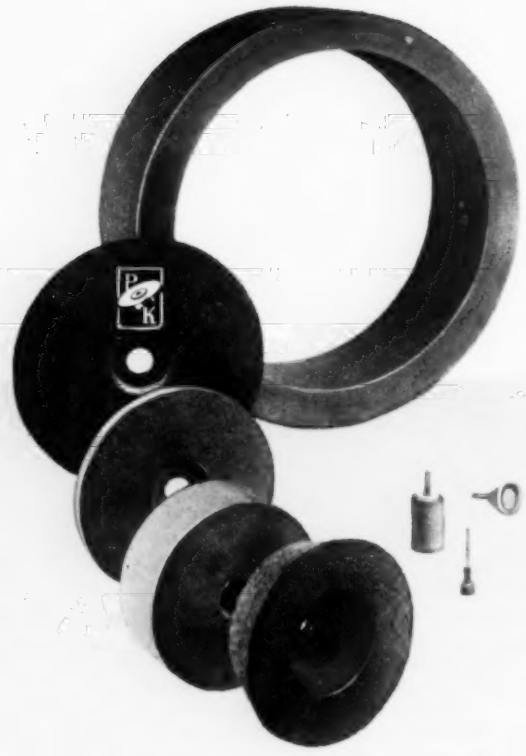
As the spindle moves on, it begins to rotate again.

The operation is smooth and continuous. A separate control panel maintains the precise pressure of the buffs. Once the operator is satisfied with the results, he need only check the ammeter for the buff motors occasionally to see if there is any change in the current load. If there should be a change, he merely adjusts the pressure until he secures the ammeter reading that originally produced the best results.

The full range of 7 Fisher weights, from a tiny 1 gram to the big 100 grams, can be buffed on the Packer machine simply by changing the spindles. Three spindles accommodate seven sizes of weights (1, 2, 5, 10, 20, 50 and 100 grams). • • •

**The operator loads weights on the 24 spindles. Waiting for action are the two buffing wheels (left and center) and the final coloring wheel (right).**





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# Two Cases for Wet Blasting

● The wet blast process is utilized by Melpar, Inc., to clean component body or leads in printed circuit board assemblies. It has insured high reliability, and has increased the component preparation rate by 50% without additional personnel. Melpar uses a semi-automatic wet blast machine.

At Melpar, one of the most vital areas of cleanliness in circuit board assemblies is the solder connection of the component lead to both the inside wall of the plated-thru hole or resistance fused eyelet, and to the etched circuitry. For that reason, all component leads are abrasively cleaned and retinned prior to assembly.

Searching for an effective cleaning method, several types were tried—brushing, chemical reaction, wiping and glass erasing—these processes were costly, required considerable handling and were not satisfactory for all types of components. Melpar prepared a specification which required a uniform and complete cleaning of the component lead, conveyorized handling of the components and quick load-unload provisions. Following an investigation of commercially available equipment, Melpar selected the wet blast machine fabricated by the Pressure Blast Mfg. Co.

**Wet blasting process at Melpar for cleaning component leads in printed circuit body assemblies offers uniform and complete cleaning, conveyorized handling and rapid-unload provisions. Fixturing on the machine is so designed to grasp the components securely around the center section completely exposing both leads to the action of the blast gun. By placing components closely together several leads are exposed to the action of the blast guns simultaneously, and distortion is held to an absolute minimum.**

**Melpar, Inc., obtains high reliability and increased production while McGraw Edison Co. reduced costs, increased production and improved detector's response time through the use of wet blasting.**

The wet blast unit was adapted from a Pressure Blast Model AA unit to meet Melpar's specifications. Open arm ports normally positioned in front of the cabinet were eliminated; a side-hinged access door was substituted. Side work-loading doors were transformed into special baffles to allow passage of the conveyor. To the left, the sheet metal extension cabinet houses the conveyor drive unit and controls, and loading takes place on top. To the right, the triangular-like extension accommodates the conveyor sprocket and serves as the unloading area. All finishing operations are fully automatic.

The machine is capable of handling approximately 4000 components an hour in slave carriers. It removes potting films, grease, tin/lead oxides and other foreign matter uniformly and precisely without damage to component body or leads. The Pressure Blast unit has increased the component preparation rate 50% without an increase in personnel.

The wet blast process utilized by Thomas A. Edison Industries, McGraw Edison Co., to clean temperature detectors following silver soldering has resulted in a consistent low cost finishing method to meet competitive prices, has allowed the use of female semi-skilled operators, has increased production from 35 to 150 pieces per hour and has actually improved the response time of the temperature detector.

*continued*

**Before and after wet blasting process shows how temperature detectors are cleaned and finished at McGraw Edison Company. Process is conducted in a Consol-Matic wet blast machine, manufactured by the Pressure Blast Mfg. Company. "The wet blast machine is producing an excellent scale free finish and has certainly helped to reduce costs on this very competitive product," states R. A. Barnes, Chief Industrial Engineer at McGraw Edison.**

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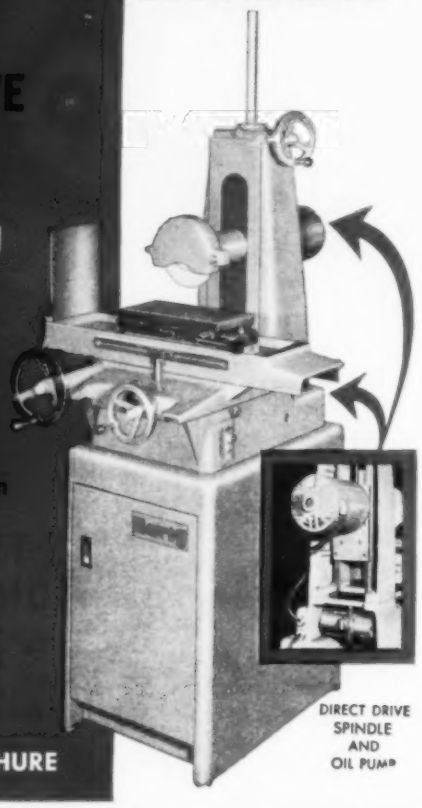

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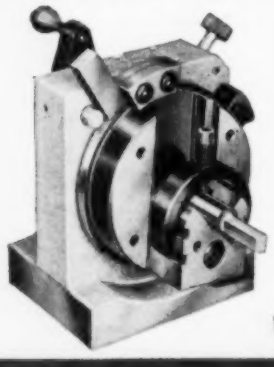

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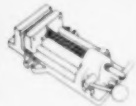

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**WET BLASTING . . .**

*continued*

Previously, McGraw Edison Co was using a polish and buff method In seeking a low cost finish for a large quantity contract for the Government they decided on a wet blast Consol Matic "sit-down" unit manufactured by the Pressure Blast Mfg. Co., Manchester, Connecticut. The process is conducted in a completely closed cabinet. An abrasive is agitated into a homogeneous water-grit mixture

**Wet blast process at McGraw Edison Co. is used to clean and finish these temperature detectors following silver soldering.**

forced out of a blast gun at high velocities by compressed air.

The Consol-Matic was specially designed for the high production rate of finishing small parts. Two bays are provided at the operating station where work is loaded and unloaded. Moving blast guns are positioned at each bay. In operation, the operator places parts in either or both bays and depresses the foot lever. This begins the movement and activation of the blast guns. A pre-set timer determines the length of blast time as well as the speed of gun oscillation.

The unit operates on the aspiration system which eliminates the need for a pumping mechanism in the blast circuit. Employing the fine abrasives (up to 5000 mesh, the Consol-Matic imparts fine, satin, chemically clean surfaces without heavy etching, stock removal or distortion.) Dimensions of the unit are 46″ high, 24″ wide and 34″ deep.

R. A. Barnes, Chief Industrial Engineer at McGraw Edison Co., states. "The wet blast machine is doing a real job in producing excellent scale free finish and has certainly helped to reduce costs on this very competitive product." • • •

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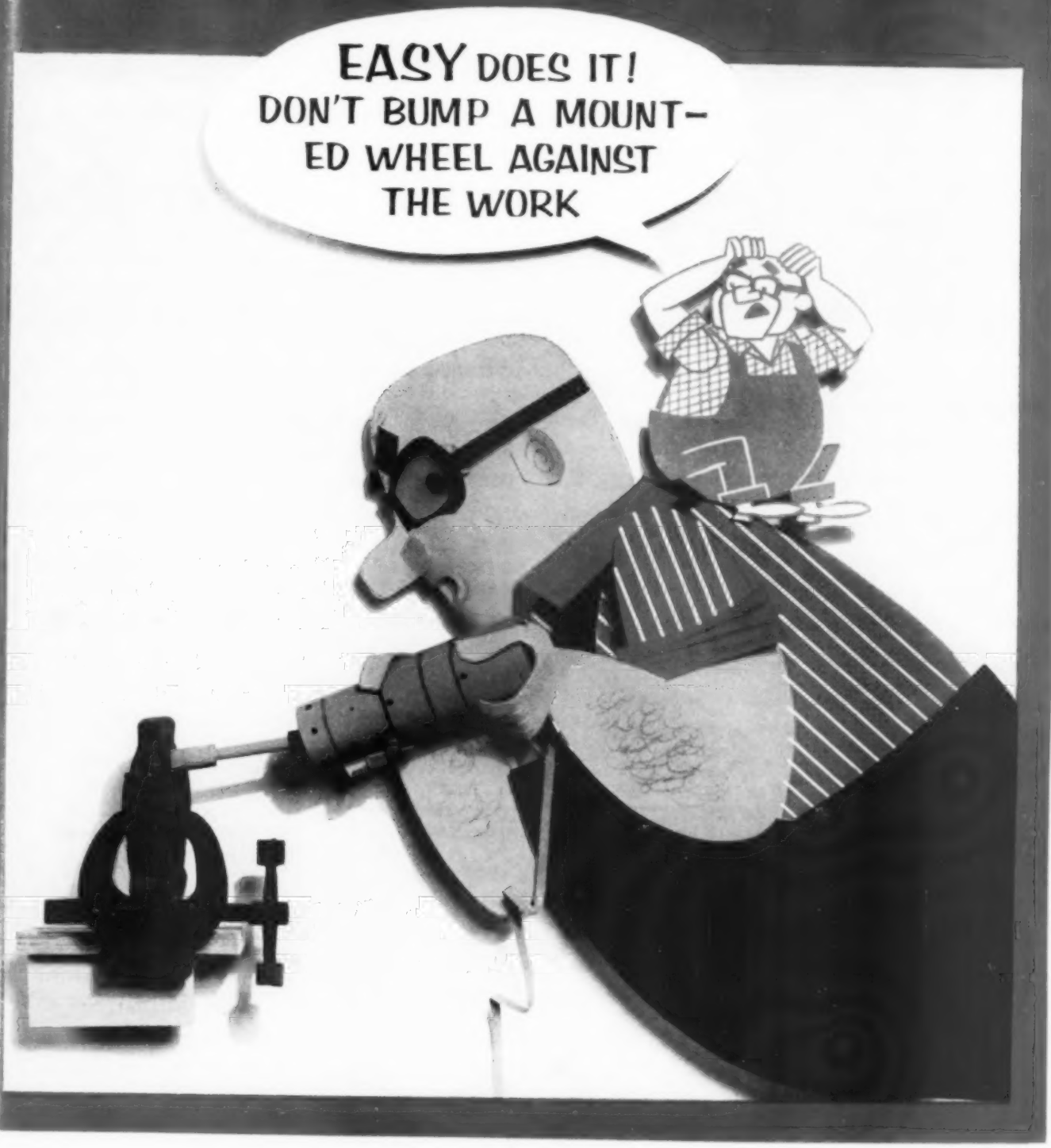

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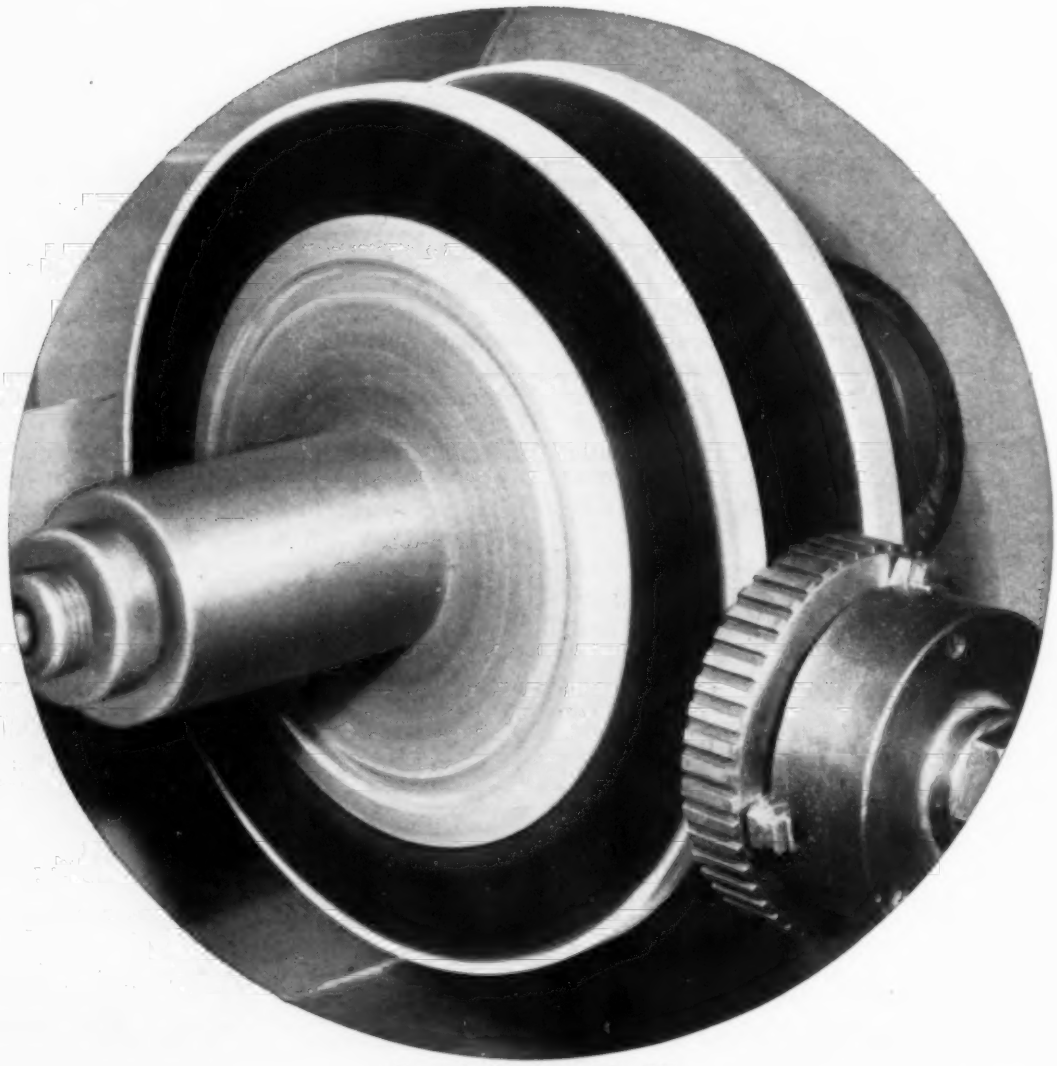

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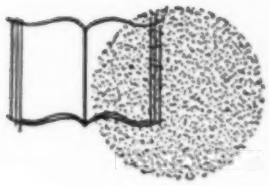


# Literature

Informative reading in abrasive operations for management, engineering, production.

### Tool Room Surface Grinders

Use postpaid card. Circle No. 1

Twenty-six-page catalog details the Gallmeyer & Livingston line of Grand Rapids precision tool room type hydraulic feed surface grinders, reported as the fastest of their respective sizes and types available. Catalog GL-5-60. Gallmeyer & Livingston Company, 336 Straight Avenue, S. W., Grand Rapids 2, Mich.

### Abrasive Cut-Off Wheels

Use postpaid card. Circle No. 2

Bulletin about regular resinoid-bonded abrasive cut-off wheels presents information about production cutting use and machine and tool-room applications. Form ESA-163. Simonds Abrasive Company, Tacony & Fraley Streets, Philadelphia 37, Pennsylvania.

### Lubrication

Use postpaid card. Circle No. 3

A recent four-page publication, "Science's Best Answer," shows the problem-solving application of "polar-attraction" lubricants to high-speed machinery. Bardahl International Corporation, 1400 West 52nd Street, Seattle 7, Washington.

### Fast Spindle Repair

Use postpaid card. Circle No. 4

Bulletin contains copious "before and after" photos to demonstrate the kind and quality of repair on all grinding spindles. Instructions to assure fast service are listed. Bulletin R-4. Pope Machinery Corp., 261 River Street, Haverhill, Mass.

### Safety Code for Wheels

Use postpaid card. Circle No. 5

This is the authority in the field of grinding wheel safety. In parallel columns it presents the code requirement and an explanation. American Standard Safety Code for the Use, Care, and Protection of Grinding Wheels, B7.1-1956. The Grinding Wheel Institute, 2130 Keith Building, Cleveland 15, Ohio.

### Measuring Surface Finish

Use postpaid card. Circle No. 6

Eight-page bulletin emphasizes the range of applications and the practicality of the Profilometer, along with its ease of operation and its use in preventing work spoilage. Form No. LT14. Micrometrical Manufacturing Company, P.O. Box 35, Ann Arbor, Michigan.

### Diamond Data

Use postpaid card. Circle No. 7

The latest issue of this technical publication (Vol. 1, No. 9) is a discussion of new requirements in grinding wheel evaluation. While this is limited to diamond wheel testing, many of the principles apply generally. Engelhard Hanovia, Inc., Industrial Diamond Division, 113 Astor Street, Newark 2, New Jersey.

### Collet Chucks and Collets

Use postpaid card. Circle No. 8

The Erickson line of collets and collet chucks is detailed in an 8-page, 2-color catalog. Dimensions, applications, and data on specials for '01, '03, and '09 series chucks are included. Catalog L. Erickson Tool Company, 34350 Solon Road, Solon, Ohio. (Greater Cleveland)

### Industrial Diamond History

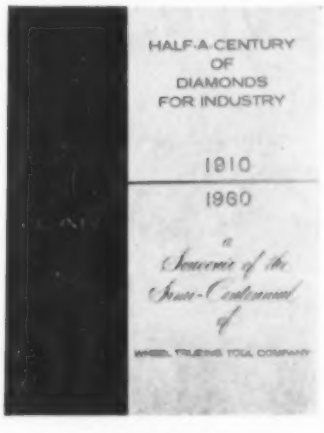
Use postpaid card. Circle No. 9

The history of a half-century of diamonds for industry is contained in Wheel Trueing's "Souvenir of the Semi-Centennial," with foreword by Harold E. Robison, president. Wheel Trueing Tool Company, 3200 W. Davison Ave., Detroit 38, Michigan.

*continued*

(See Number 2)

(See Number 4)




(See Number 9)

## You can cut cost corners fast with
# STAR DUST DIAMOND WHEELS

Star Dust Diamond Wheels cut cooler, freer and faster due to newly improved bonding techniques and rigid quality control in the selection and grading of diamonds, both natural and man made.

*Get all the facts on Ace Abrasive Laboratories' line of resinoid and metal bond Star Dust Diamond Wheels and Diamond Abrasive Products. Write or call for free catalog "H" today.*

ACE ABRASIVE LABORATORIES, Inc.

Ploneer 6-3347
35 Roselle St.,
Mineola, L.I., N.Y.

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## FREE LITERATURE *continued*

### Roll Grinding Wheels
Use postpaid card. Circle No. 10

Four-page brochure explains the wheel qualities required in modern roll grinding, describes applications on various kinds of rolls. Complete wheel recommendations included. Macklin Company, 2917 Wildwood Road, Jackson, Michigan.

(See Number 10)

### Rotary Tables
Use postpaid card. Circle No. 11

Four-page bulletin presents complete technical and application specifications for high-precision Ultraron® rotary tables. Work can be mounted on these tables for lapping, vertical or horizontal grinding, or for inspection. AA Gage Company, 350 Fair Street, Detroit 20, Michigan.

### Form Grinding Attachment
Use postpaid card. Circle No. 12

Two-color bulletin of four pages describes a pantographic attachment, the Tracaform, a spindle-mounted 1:1 ratio contour wheel dresser. Unit designed to fit most surface grinders using 7" or smaller wheels. Tracaform Corporation, 11380 Kaltz, Warren, Michigan.

### Blast Cleaning Equipment
Use postpaid card. Circle No. 13

Two-color, 12-page bulletin describes push-button controlled LK and LM Rotoblast Table-Rooms designed to blast clean pieces ranging from small parts to castings or weldments up to 10' wide and weighing as much as six tons. Bulletin No. 805. Pangborn Corporation, 780 Pangborn Blvd., Hagerstown, Md.

### Combination Grinder
Use postpaid card. Circle No. 14

Parker-Majestic's No. 1 combination (internal and external) grinder is discussed in a four-page folder with an inserted price list. Interchangeable spindles and accessories are also listed. Parker-Majestic, Inc., 147 Jos. Campau, Detroit 7, Mich.

### Surface Grinders

Use postpaid card. Circle No. 15

Six-page two-color folder describes the Footburt-Hammond surface grinding machine and other metal-working machines. The Foote-Burt Company, 13000 St. Clair Avenue, Cleveland 8, Ohio.

### Hard Gear Finishers

Use postpaid card. Circle No. 16

Six-page bulletin describes the Michigan Model 999 abrasive hard gear finisher and its use in final surface conditioning of gear teeth after hardening. Bulletin No. 999-60. Michigan Tool Company, 7171 E. McNichols Road, Detroit 12, Mich.

(See Number 16)

### Surface Grinder

Use postpaid card. Circle No. 17

Specifications and description of the No. 18D-30 and No. 18D-36 Blanchard vertical surface grinders are the subject of this four-page folder. Form 411. The Blanchard Machine Company, 64 State Street, Cambridge, Massachusetts.

### Multiple Wheel Grinder

Use postpaid card. Circle No. 18

Landis 10" and 14" Type IWR semi-automatic wheel grinders are illustrated and described in a 16-page catalog. The principal advantage claimed for this type of grinder is its ability to grind multiple line diameters simultaneously in one operation. Catalog IWR-60. Landis Tool Company.

### Economy Optical Comparator

Use postpaid card. Circle No. 19

Six-page gatefold describes the Jones & Lamson economy model 14" screen optical comparator and measuring machine, the PC-14A. This is an improved version of their standard PC-14. Form CO-6009. Jones & Lamson Machine Company, Optical Comparator Division, Springfield, Vermont.

### Ultrasonic Machining

Use postpaid card. Circle No. 20

"Machining the Unmachinable" is a clear explanation of the techniques and applications of ultrasonic machining as well as a presentation of the mechanical details of the Sheffield Cavitron. The Sheffield Corporation, Box 893, Dayton 1, Ohio.

• • •

WHAT'S COOKIN'? FM SEGMENTS...
made to order and ready to serve in 7 days!

Any time you really need urgent help, you can count on Fuller Merriam for 7-day delivery on top quality vitrified segments . . . **made to your order!** Or 14-day service under ordinary circumstances! Our 68-foot rotary tunnel kiln is one of the reasons why.

Automatically operated, this oil-fired unit runs continuously, year in, year out at a constantly controlled 2300° F. There's never a shut-down for loading and unloading . . . for firing and cooling! Segments go through on a non-stop "train" that can cut delivery time by **weeks!**

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AND RESINOID
WHEELS
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Use postpaid card. Circle No. 227

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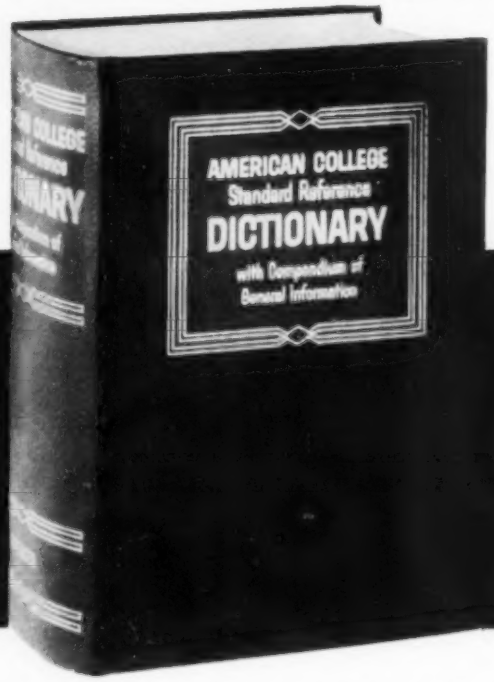


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# American Society for Abrasives

## MATTISON SALES HEAD AT CHICAGO CHAPTER

William C. Knapp, metal working sales manager for Mattison Machine Works, Rockford, Illinois, talked about "Surface Grinding vs. Machining" at a meeting of the Chicago chapter, Thursday, January 12, at the Old Spinning Wheel, Hinsdale, Illinois.

Charles Freestate, plant superintendent at the Marshall Steel Company, Chicago, was technical chairman for the session.

Knapp was appointed to his present position in 1954, after twenty years of experience in the East as a field sales and service engineer and prior shop experience and apprentice training.

Films showing actual job applications on a variety of grinders were shown, emphasizing the part played by high horsepower and rigid construction in full utilization of today's grinding wheels.

Alan Mattison, president of the company, headed the group accompanying Knapp. Also attending were Arthur Mattison, chief engineer; Russell Holmes, senior engineer, metalworking division; and Walt Hagstrom, advertising manager.

Approximately 85 members and guests, a record for this season, attended the meeting. A discussion period concluded the program.

## NEW JERSEY TO DISCUSS GRINDING SYSTEMS

The New Jersey chapter was scheduled to discuss "The Theory of the Grinding Systems Approach," with John A. Mueller, manager of Carborundum's grinding and testing laboratory, in January.

## LONG ISLAND INSTALLS 1961 OFFICERS

Officers and executive committeemen elected in December were installed by the Long Island chapter at an informal dinner January 11 at Wheatley Hills Tavern, Westbury, N.Y. Forty-two members attended.

Camillo Honor heads the chapter for another year. He is from J. Soehner & Sons. From the same firm, re-elected vice president, is William F. Soehner. Other officers re-elected are recording secretary Philip Krop, K & K Grinding; Herman Golden, Kappel & Mazur, corresponding secretary; and Joseph Urgo, Di-Tru Diamond Tool Co., treasurer.

Serving on the executive committee for one-year terms are Robert T. Ryan, Grumman Aircraft; Milton Schwartz, Advanced Food Service Equipment, Inc.; John J. Rohatsch, J & J Cutter Co.

Serving for two-years are James J. McCarthy, Carborundum; Leon A. Zweig, Cavitron Equipment Co.; and Paul A. Leib, of Grumman.

Program feature of the evening was a film on hydroplane space travel from Grumman Aircraft.

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## WESTERN MASS. HEARS KENDALL, OF CORTLAND

Norman Kendall, factory manager, Cortland Grinding Wheels Corporation, Chester, Mass., spoke on "Grinding Wheel Selection" at a meeting of the Western Massachusetts Chapter on Monday, January 16, according to a chapter announcement.

Full details will be covered next month. There was no December meeting.

## CLEVELAND EXPLORES NEW COATED APPLICATIONS

W. K. Seward, supervising engineer, market development and product application, Coated Abrasive Division, The Carborundum Company, talked about new techniques and applications of coated abrasives at the Cleveland meeting, Thursday, January 12. The gathering was held at the Cleveland Engineering and Scientific Center.

## EXPANSION MOVES REPORTED TO NATIONAL DIRECTORS

Reports to the National Board of Directors at their October meeting are that ASA chapters are being formed or that requests for assistance in getting started have developed in Baltimore, Buffalo, Dallas, Houston, Kansas City, Milwaukee and Oklahoma City. Similar reports have previously come from Brantford, Ontario, and Indianapolis.

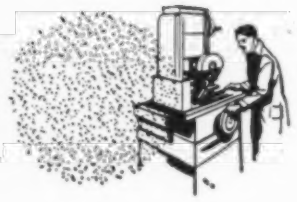
Maguire Brothers is reported as the focal point for Baltimore. Gene O'Connor, of O'Connor Abrasive Sales, is active in the Buffalo move.

Prospective members in these areas are urged to write national headquarters, American Society for Abrasives, 120 North Fifth Street, Reading, Pennsylvania for further information.

## W. MICHIGAN PLANS PROGRAM DIRECTION

The December meeting of the Western Michigan chapter was a members-only discussion of program and objectives. • • •

# Equipment and Materials



## DEVELOP NEW ABRASIVE FOR PRECISION GRINDING

Norton Company's newly-introduced 23 Alundum (aluminum oxide) abrasive grain, developed primarily for use in segments for surface grinding, has been finding uses in centerless and general purpose grinding as well.

The new abrasive, according to the manufacturer, combines the friable, free cutting characteristics of 32 Alundum with the durability of 57 Alundum. Wheels and segments of the new abrasive sell at non-premium prices.

Field tests are reported to show that 23 Alundum segments grind more pieces per dressing with less tendency to burn, and give longer life than segments used previously for the same operations.

Part of the field testing was done at the Wyman-Gordon die shop in Worcester, Mass., where the photograph was taken.

It shows 23 Alundum segments on a 42" Blanchard grinder being used in the first machining step on a 3-ton octagonal piece of Heppenstall Hartem B to grind the top surface. The workpiece will be machined to form a die for forging a compressor wheel for a jet engine.

In this operation the table turned at 4.8 rpm, and downfeed was .012"/min. Coolant was Cincinnati Milling 1500 water soluble oil.

This machine is used for grinding a variety of steels, some hard and some soft. 23 Alundum segments can be used on this full range of steels, reducing the number of segment changes required.

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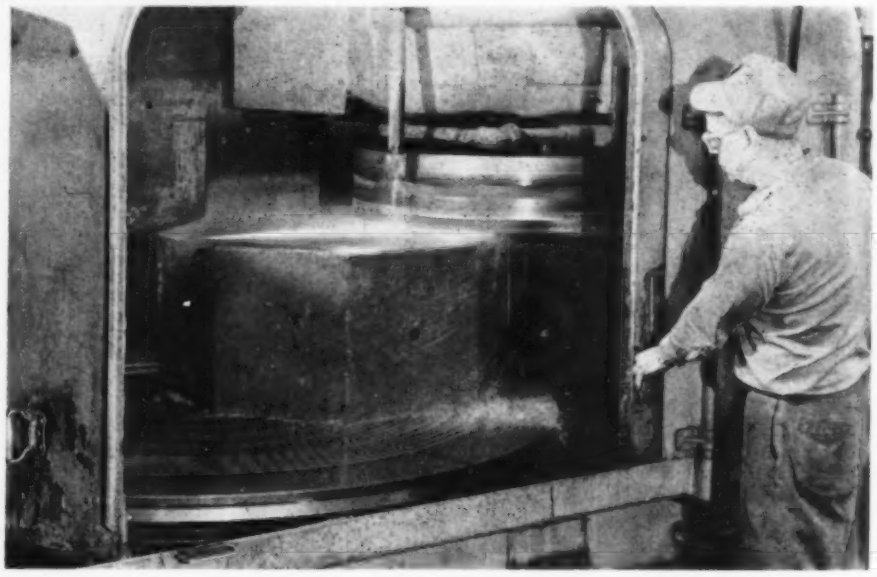
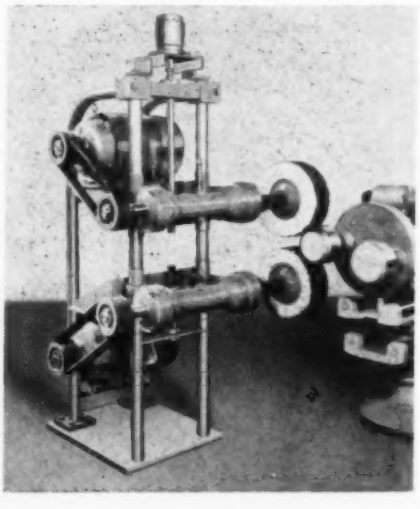


**Grinding the surface of a rough blank of die steel with 23 Alundum abrasive segments. Coolant flow restricted and splash guards opened to permit photographing the operation.**

## DUAL-SPINDLE LATHE CUTS FIXTURING TIME

A dual-spindle lathe for polishing, buffing, deburring, and brushing, Murray-Way's Model L12, can be used with a semi-automatic part-positioning machine to do jobs formerly requiring two machines.



Transfers to a second fixture are eliminated, and less floor space is required.

Designed with a minimum of frills and extras, the L12 lathe employs two separate spindle assemblies mounted on one base. When both wheels are used for the same operation, production is doubled.

If one wheel is used for cut-down and the other for coloring, the job is finished with only one fixturing of the part.

Murray-Way Corporation, P. O. Box 180, Birmingham, Michigan.

Use postpaid card. Circle No. 42

## SURFACE GRINDER REPORTED LARGEST OF TYPE

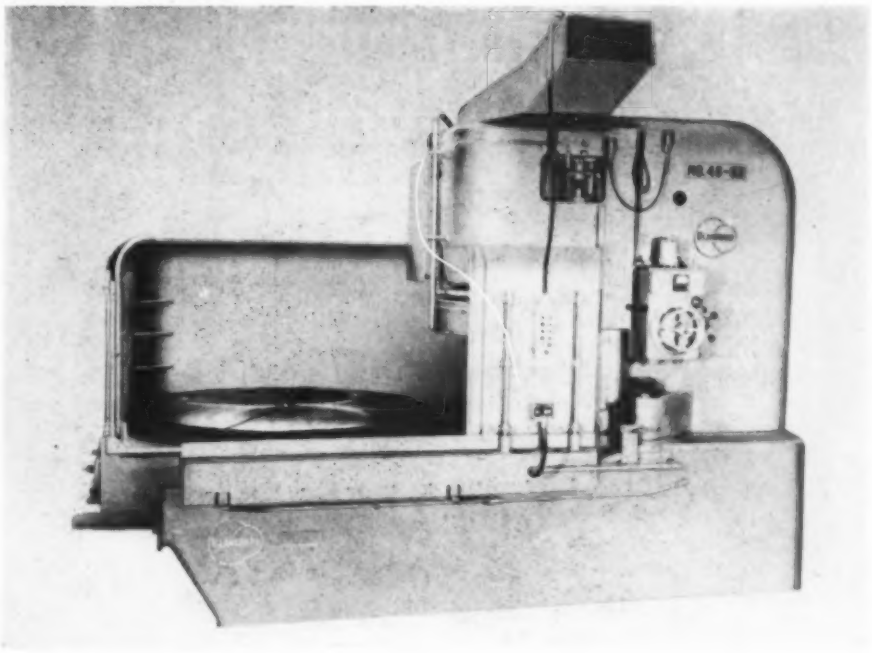
Blanchard's new No. 48-96 is reported to be the largest vertical spindle surface grinder available.

The machine has a 96" diameter, full magnetic chuck, and will swing to grind to the center of work up to 108" in diameter. Maximum work load is 10,000 lbs.

Work up to 40" in height can be accommodated under a new 48" diameter Cortland type segment wheel. The chuck completely clears the wheel when in the loading position. Extra wide base ways and guide strips for the chuck table are hardened to assure long, accurate life.

Regularly supplied with 100 hp spindle motor, the new grinder is also available with motors up to 150 hp.

This new grinder features advanced design throughout its construction. For example, a 10 hp motor is used for chuck rotation. The main spindle motor can be provided with a direct current brake. Automatic lubrication is furnished as standard equipment, for the base ways, and also for the column ways, wheel dresser, and feed screw.



The No. 48-96 grinder is available as a "dry base" machine. Coolant and sludge may be discharged out of the base into a settling tank, separator, or central cooling system.

Other details which may be of interest: 1) wheel speed is 360 rpm, and chuck has four geared speeds of 2.6, 4.1, 6.7 and 10.2 rpm; 2) domestic shipping weight is 78,000 lbs; 3) power down feed for wheel is variable from .004" to .080" per minute; 4) wheelhead is raised or lowered rapidly by power, and is interlocked with the feed.

The Blanchard Machine Company, 64 State Street, Cambridge 39, Mass.

Use postpaid card. Circle No. 43

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## AIR TOOL BALANCER CUTS PORTABLE TOOL DAMAGE

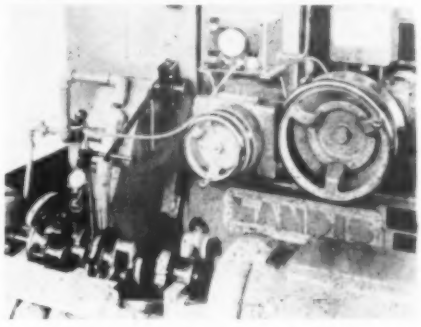
A pneumatic tool balancer introduced by Airetool reduces tool damage, cuts replacement costs, according to the manufacturer.

With the balancer, tools are out of the way, but within easy reach. The balancer is portable, can easily be hooked to an overhead beam. Airetool hose couplers are designed for positive heavy-duty service, are said to produce maximum air flow with minimum pressure drop.

The Airetool Manufacturing Company, 302 South Center Street, Springfield, Ohio.

Use postpaid card. Circle No. 44

## LOW-COST AIR-ELECTRIC GAGE FOR CYLINDRICAL



The "Econo-Sizer" (Model 133 M-96) is a simplified air-electric gaging unit that provides effective and reliable dimensional control at the lowest possible cost, according to the manufacturer.

A power-handling relay operates directly from the air-electric switch to initiate the signal to retract the grinding wheel. A finish-size signal is given if there is a power failure.

The air-electric system provides a cushioned response to work size variations so that the gage is unaffected by minor surface irregularities.

The gage can be installed on any plunge-cut cylindrical grinder with a hydraulically-powered wheel slide mechanism.

It can be supplied with an Arnold grinding gage caliper or with any suitable caliper designed for air measurement.

Federal Products Corporation, Providence 1, Rhode Island.

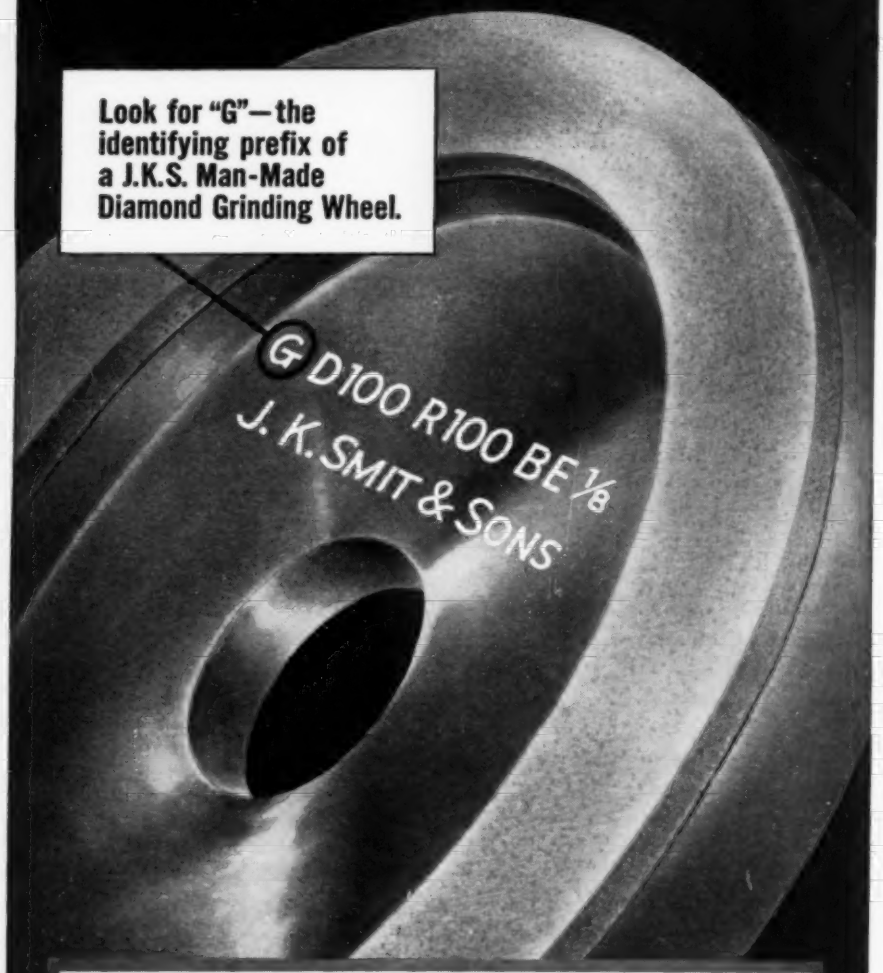
Use postpaid card. Circle No. 45

## VIBRATORY FINISHER DESIGNED FOR SMALL PARTS

A compact, self-contained vibratory finishing machine, Pangborn's

*continued*

# The Beginning of a Revolution!




## J.K.S. Diamond Wheel Developments Slash Grinding Costs—Speed Production

Now, one of the world's most experienced manufacturers of diamond grinding wheels has brought its technical knowledge to the production of man-made diamond wheels.

The result is a revolutionary advance. Today's new J.K.S. man-made diamond wheels give longer life in many applications . . . speed up production on many difficult grinding jobs. Yet there is no extra cost . . . they are now priced the same as wheels made with natural diamonds.

In these wheels, too, you get a famous J.K.S. plus value: exact uniformity in wheel construction . . . duplicated in wheel after wheel . . . an advantage that results from special J.K.S. techniques and quality control.

**NEW DIAMOND WHEEL CATALOG NO. 65**

A necessary reference publication for everyone who buys or uses diamond grinding wheels . . . send today for Catalog, "J.K.S. Diamond Wheels, Saws and Hones."

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Model 1½ YA, with a work container capacity of 1½ cu ft, was designed as a production unit for finishing small parts. It has found a variety of applications on metal, plastic, and ceramic items.

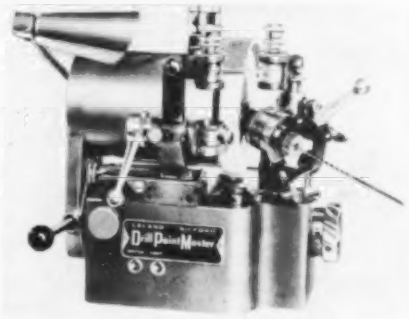
The rubber-lined work container holds up to 500 lb of media and work pieces and is supported by a system of air cushions. Amplitude as well as frequency is variable.

The machine may be operated in buildings where structural limitations prohibit the use of conventional spring-mounted machines. When placed on air-cushioned floor mounts no vibration is transmitted to the floor.

Pangborn Corporation, 780 Pangborn Boulevard, Hagerstown, Md.

Use postpaid card. Circle No. 46

### DRILL GRINDER ENDS SMALL HOLE DRILLING PROBLEMS



The Drill Point Master is capable of producing and reproducing any desired point on any drill from No. 80 to .250" diameter—the range where hole accuracy and drill life present the most acute problems.

Unique features of this ultra-precision drill grinder include: independent adjustment of point angle, lip length and relief angle; two variable power microscope viewers and sealed beam light to assist in precise setting; point angle adjustable by degrees from 60° to 180°; lip relief from 0° to 26° and point thinning controlled to a thousandth of an inch by micrometer adjustments of wheel slide and point thinning carrier. All settings can be logged for exact duplication at any time.

Leland-Gifford, Worcester 1, Massachusetts.

Use postpaid card. Circle No. 47

## SHARP-SIDED CUT-OFF WHEEL PROVIDES 3-WAY CUTTING

A new type cut-off wheel manufactured by American Emery Wheel cuts on both sides of the wheel as well as on the face. On this Sharp-Sided (SS) cut-off wheel, the three-sided abrasive reduces friction.

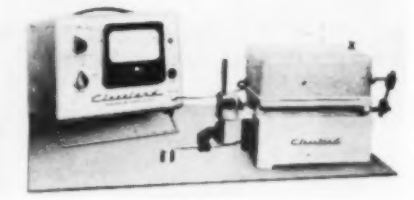
Because the wheel grinds its own clearance, it produces a faster cut with less burn and burr. According to the manufacturer, the reduction of heat also reduces wheel wear and permits the use of harder wheels.

The wheel is available in resinoid bond only.

American Emery Wheel Works, 1 Richmond Square, Providence 1, Rhode Island.

Use postpaid card. Circle No. 48

## PRECISION SLIDES MEASURE WITHOUT SKIDS



Because of the increased demand for equipment capable of measuring surfaces too small to permit both the pickup skids and diamond stylus to be located on one part, the Cleveland Instrument Company now offers three new skidless pickup models designed to measure very narrow or small areas, such as flanges, thread flanks, gear teeth, small internal diameters, and "O" ring grooves.

The Model BK 3922F precision slide makes possible surface measurements without skids—the reference line normally provided by the skids being generated by the slide. Movement of the slide is produced by mechanical coupling to Model BK 3911 power trace.

*continued*

OLSON FILTRATION ENGINEERS *Cincinnati 12, Ohio*

OL-17-G

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*Firm Name*_____

*Address*_____

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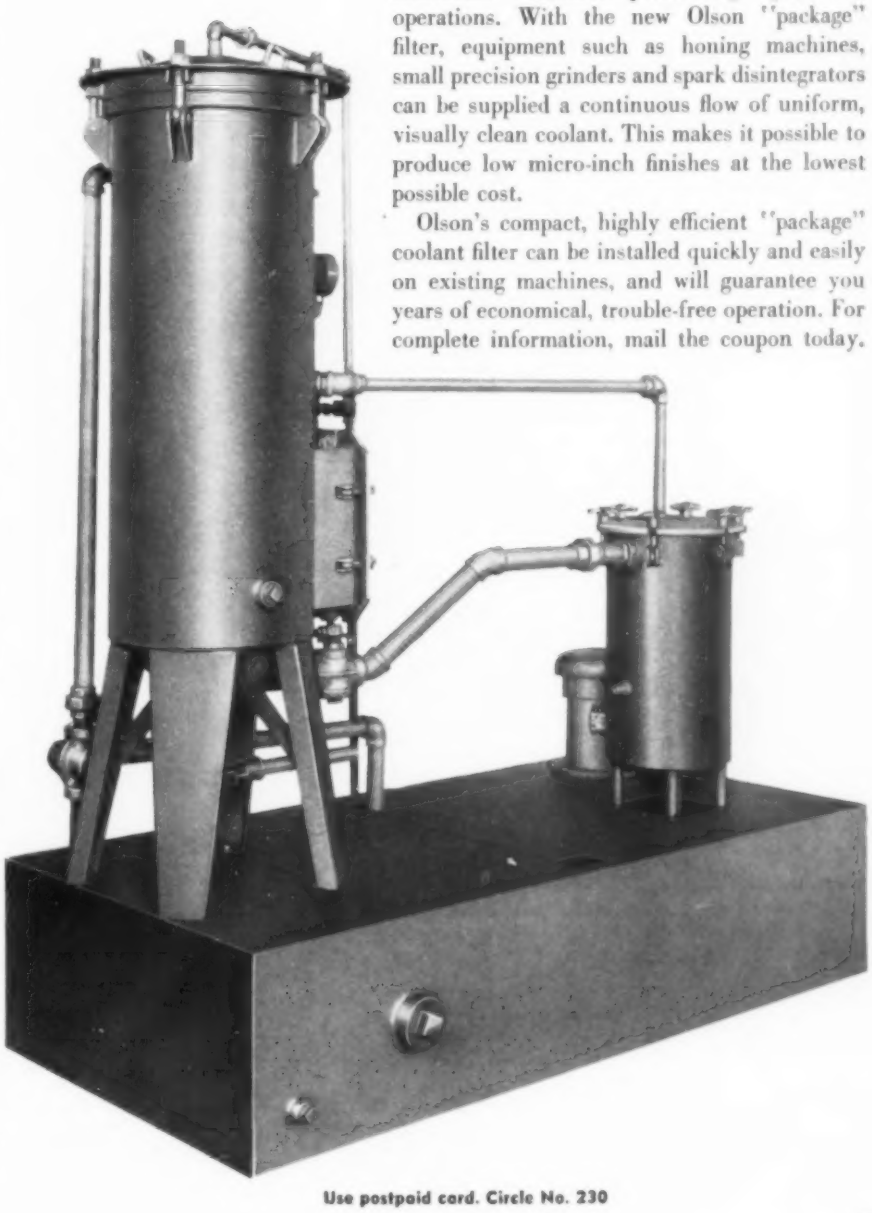
Now you can lower your cost-per-part even on individual machines performing specialized operations. With the new Olson "package" filter, equipment such as honing machines, small precision grinders and spark disintegrators can be supplied a continuous flow of uniform, visually clean coolant. This makes it possible to produce low micro-inch finishes at the lowest possible cost.

Olson's compact, highly efficient "package" coolant filter can be installed quickly and easily on existing machines, and will guarantee you years of economical, trouble-free operation. For complete information, mail the coupon today.



Use postpaid card. Circle No. 230

With this combination stroke adjustments are thus controlled from lengths of trace from .005" to 1½". Surface of less than one microinch can easily be measured by the equipment mounted on the surface plate.

Model MP 0002SL general purpose skidless pickup excels in the measurement of small I.D.'s and O.D.'s, flanges, thread flanks, gear teeth, or other applications where limited area measurements exist. With this equipment measurements can be made to within .020" of the shoulder. It must be used with the precision slide power trace. For the measurement of surfaces behind flanges or shoulders and groove bottoms, the Cleveland Model MP 6100SL groove bottom skidless pickup is gaining wide usage. This model also must be used in conjunction with the precision slide power trace. Existing Cleveland roughness meters can be used for skidless measurement with the addition of the precision slide Model BK 3922 R.

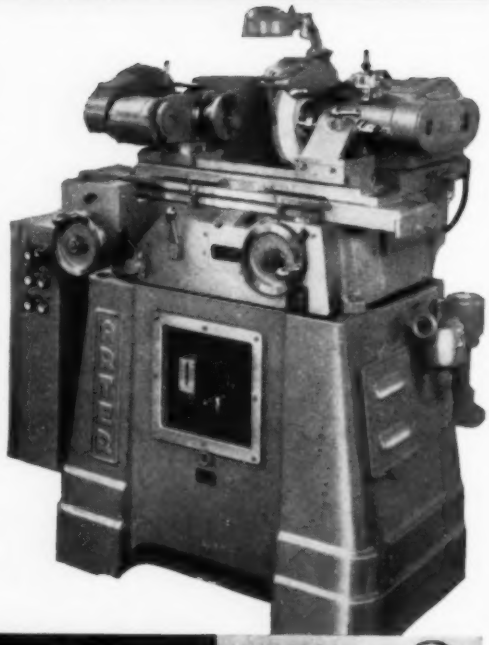
Cleveland Instrument Company, 6220 East Schaaf Road, Cleveland 31, Ohio.

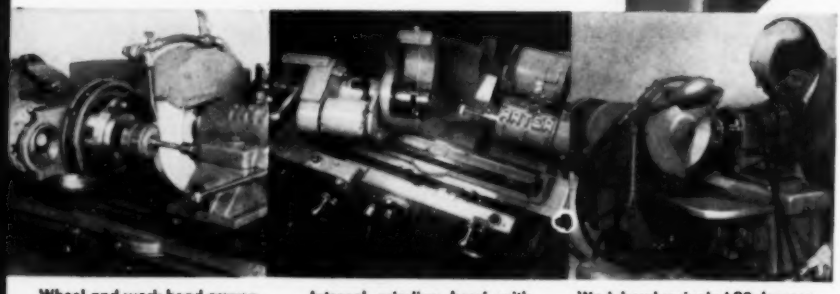
Use postpaid card. Circle No. 49


**Best buy for toolroom or small-capacity production grinding**

The Sundstrand-Arter Model 103 can be arranged for cylindrical or internal grinding. Wheel heads swivel 15 degrees either side of center — work head swivels 90 degrees. It's ideal for toolroom or production work where a small-capacity machine is needed, or for supplementing larger grinders when work piles up. Multiple-jaw chucks, faceplates, and other chucking accessories can be quickly attached to spindle nose.

Sundstrand-built to highest precision standards, this moderately priced grinder has a complete hydraulic movement of table and wheel head. Maximum capacities: external—3" OD, internal—3" ID.





Wheel and work head arranged to grind cylindrical work.

Internal grinding head with work head swiveled.

Work head swiveled 90 degrees to grind a gear shaper cutter.

*For complete information, write for Bulletin 918.*

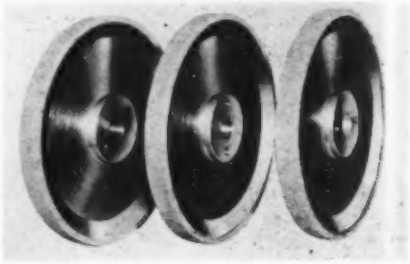
MARK OF RELY-ABILITY

SUNDSTRAND ARTER

SUNDSTRAND MACHINE TOOL
BELVIDERE, ILLINOIS
Division of SUNDSTRAND CORPORATION

Use postpaid card. Circle No. 231


## TUNGSTEN CARBIDE COATED WHEELS GRIND RUBBER



A new line of tungsten carbide coated abrasive wheels, trademarked Tunco®, is designed to overcome common finishing problems in the rubber goods industry.

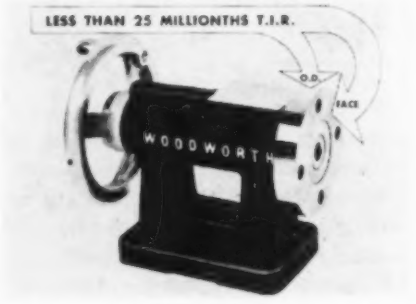
The new wheels are produced by a specially developed process whereby carefully sized fragments of tungsten carbide are bonded to a basic tool form. Abrasive grade and shape of tool are readily adapted to meet specific requirements.

Typical applications include tire finishing, roll grinding, and flash cut-off and trimming.

Burgess-Norton Mfg. Co., Geneva, Illinois.

Use postpaid card. Circle No. 50

## BEARING BLOCK ASSEMBLIES CERTIFIED 25 MILLIONTHS



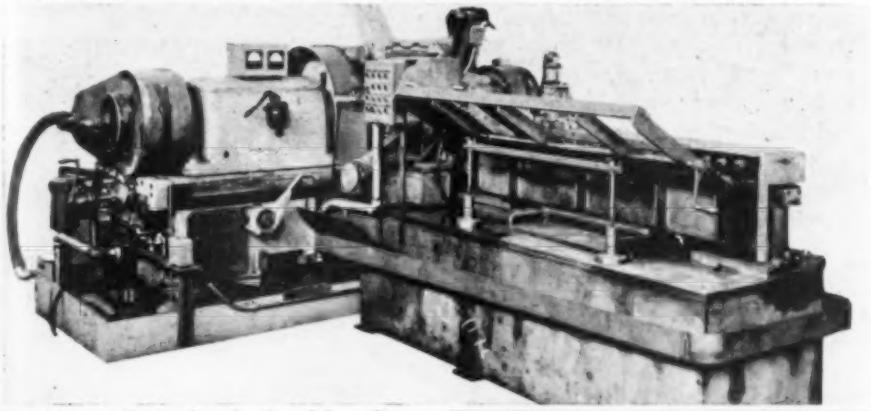

"Zero-Spindle" bearing block assemblies are now certified to a concentricity of less than 25 millionths TIR (OD and face runout). This reduces the total tolerance required in inspection fixtures and permits greater latitude in checking manufacturing tolerances.

Four sizes of assemblies are available from stock. Indicator mount assemblies and base plates are stocked for off-the-shelf delivery.

N. A. Woodworth Company, 1300 East Nine Mile Rd., Detroit 20, Mich.

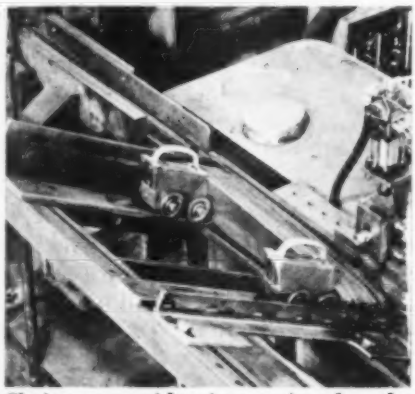
Use postpaid card. Circle No. 51

## HIGH STOCK REMOVAL ON CHAIN-FEED DISC GRINDER



**Mattison chain-feed double disc grinder.**

Up to 5 cu in. of stock per minute were removed in production tests recently conducted by Mattison Machine Works, Rockford, Illinois, on a new chain-feed, double-disc grinder, No. 230. Rigidity, positive spindle feed, and 50-horsepower spindle drive motors account for the grinder's ability to remove stock.



**Chain saw guides in varying lengths up to 60" are fed into the double-disc grinder without adjusting the load and feed mechanism.**

The "disappearing line" principle of Mattison's new chain-feed mechanism permits a variety of piecepart sizes to be fed into the machine without adjustment or change in the loading and feeding mechanism. Closely spaced drive links drop into neutral position when interference pressure from the piecepart is applied, leaving any free succeeding link to drive the part. Thus, it is possible, and practical, to feed a variety of different sized parts in the same production run.

On chain saw guides made of high-carbon steel, total stock removal of .015" is accomplished in a single pass on the new disc grinder at a feed rate of 8 ft per minute. Size is held to .002" and parallelism, end to end or side to side, is held to .001".

Zoned discs, 30 x 1 x 24 x 20 x 12, 46 grit aluminum oxide, in N and K grades, were used in the tests.

A dial indicator tells the operator when wheel wear approaches size limits. To compensate for wear, a ratchet-operated feed, powered by an air cylinder, can be actuated manually by the operator in accordance with size control indicator readings.

The Mattison No. 230 double-disc grinder features an extra-rigid wheel mounting and a positive feed screw mechanism that eliminates all deflection from the workpiece. This assures positive cutting action and exact size control.

Use postpaid card. Circle No. 52

*continued*

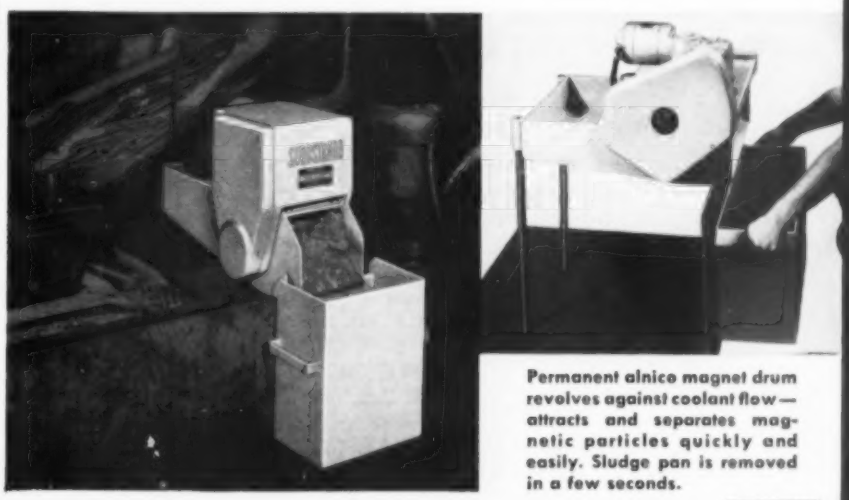

**In no time at all, you can install a Sundstrand coolant separator**

**. . . to lengthen wheel life, improve finishes, reduce downtime, eliminate sump cleaning, and the number of coolant changes.**

Installation is easy, separator can be placed right on open coolant tanks in most machines — no repiping or fitting necessary.

Maintenance is quick and easy. Separated material is deposited into a sludge pan which can easily be removed for cleaning in a few seconds, without any tools. No more sumps to be cleaned out.

You will save money and improve the quality of your grinding, honing, and gear shaving operations with Sundstrand magnetic coolant separators. They're available in four capacities: 25, 50, 75, and 100 gpm.



**Permanent alnico magnet drum revolves against coolant flow — attracts and separates magnetic particles quickly and easily. Sludge pan is removed in a few seconds.**

*Bulletin A368 gives complete data. Write for your copy today.*

MARK OF RELY-ABILITY

SUNDSTRAND POWER-GRIP

SUNDSTRAND-AMERICAN BROACH
ANN ARBOR, MICHIGAN
Division of SUNDSTRAND CORPORATION

Use postpaid card. Circle No. 232

### SYNTHETIC COOLANT FOR HEAVY-DUTY MACHINING

E. F. Houghton & Co. is now marketing a synthetic, water-soluble base for heavy-duty machining, an application previously limited to reinforced petroleum coolants.

This base is high in both sulphur and chlorine providing anti-weld and extreme pressure properties which assure high finish and extended tool life. The base, when mixed with water, provides a stable emulsion even for long periods of continued use.

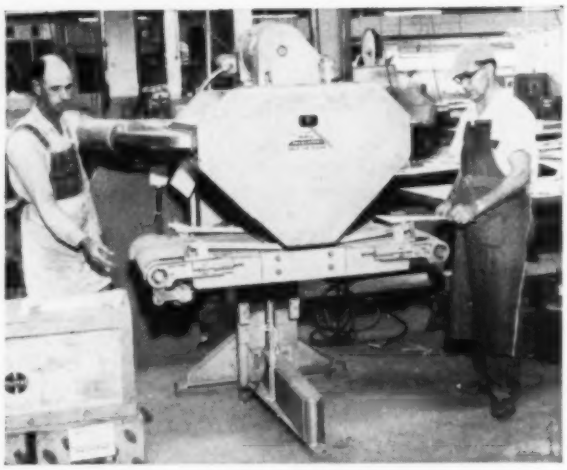
The product, known as Hocut No. 3210, has been thoroughly field-tested for a variety of uses and is recommended for machining of tough alloy steels, for threading, tapping and also as a stamping and drawing compound.

E. F. Houghton & Co., 303 West Lehigh Avenue, Philadelphia 33, Pa.

Use postpaid card. Circle No. 53


# 43.2 hrs. Saved on 3590 pcs.

## at BEECH AIRCRAFT CORPORATION



28 Types of aluminum, steel and titanium parts were processed on this 12" TRI-MATIC Oscillating Belt Grinder.

## Time Cut From 60.6 hrs. to 17.4 hrs.

The standard time on these parts totaled 60.6 hours and the TRI-MATIC time totaled 17.4 hours; a saving of 43.2 hours or 71%.

After these savings were established on a 12" machine, an 18" TRI-MATIC was installed and given a "speed-up" test. The feed was increased from the recommended 16 f.p.m. to 27 f.p.m. ". . . with no loss of quality detected and an operating gain calculated at 59%." They also report excellent belt life, very good quality and extremely close tolerances maintained. A copy of this report with detailed data is available on request.

**EXPERIMENTAL LABORATORY** facilities are available to study the application of the TRI-MATIC Oscillating Belt Grinder to **your** problem at no cost. Actual samples will be processed and returned with the recommendations of our abrasive engineers. Write TODAY for details.

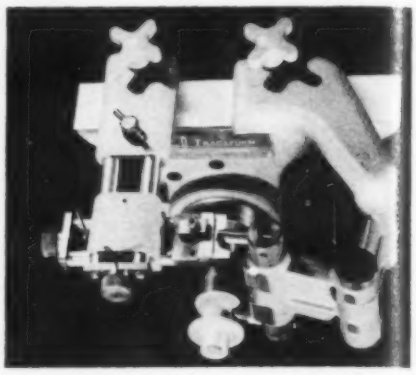
TRI-MATIC Oscillating Belt Grinders, 12", 18", 24", 36" and 48", are described in detail in Bulletin TM-860. Write for your copy.

*Sales Service Mfg. Co.*

**2365 University Avenue** **St. Paul 14U, Minnesota**

Use postpaid card. Circle No. 233


### TOOL DRESSES COMPLEX WHEEL SHAPES TO "TENTHS"



The Tracaform Model SMD-704 spindle-mounted contour wheel dresser is described as a "cost-saving tool capable of dressing complex shapes in grinding wheels to 'tenths' accuracy." It is a 1:1 ratio template tracing wheel dresser, designed to fit most surface grinders using a 7" diameter wheel or less. The new model will dress wheels from 7" diameter by 4" wide down to the smallest mounted wheels.

The dresser is a spindle-mounted unit which may be left on the machine permanently or it may be moved from one machine to another.

The mounting casting is bored to fit a 3" diameter standard spindle and clamps securely by tightening two screws. The bore can be sleeved down to fit smaller diameter spindles, or it can be specially bored to fit spindles up to 3.25" diameter. The wheel guard is mounted on two support pins and can be adjusted in, out or radially.

It is not necessary to use lapped diamonds in the Tracaform wheel dresser. The diamonds may be of any shape or size as long as they enter the form being dressed.

Tracaform Corporation, 11380 Kaltz, Warren, Michigan.

Use postpaid card. Circle No. 54

### WATER-SOLUBLE MACHINING BASE PREVENTS CAKING

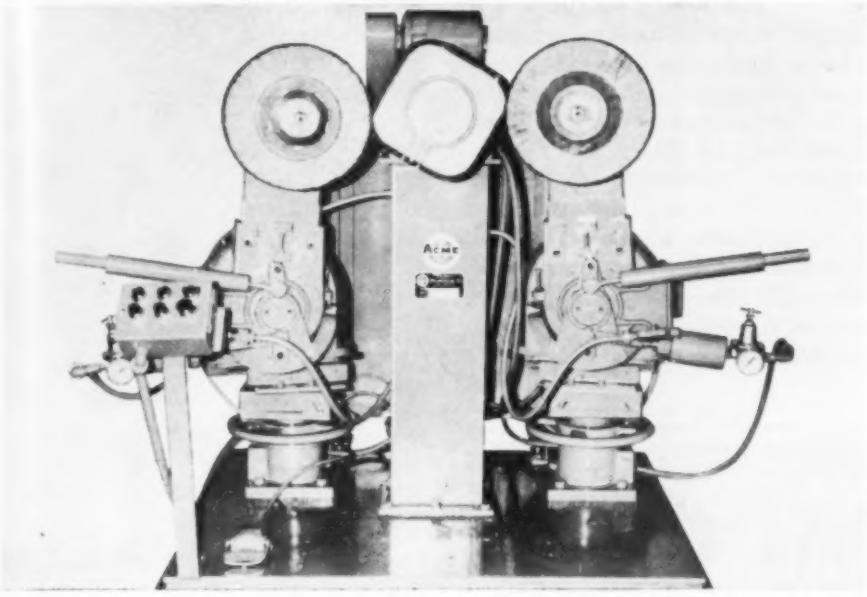
A new base has been developed to sink aluminum chips and prevent caking of aluminum fines. It is said to increase grinding wheel life up to 40% in some cases, by replacing conventional oils.

The base, listed as No. 505 by the manufacturer, makes a stable white emulsion in water and has high resistance to bacterial growth.

Baker/Gubbins Company, 1448 Wabash Avenue, Detroit 16, Mich.

Use postpaid card. Circle No. 55

## DOUBLE HEAD BUFFING UNIT FINISHES ROUNDS, OVALS



An Acme self-contained double head automatic polishing and buffing machine has been designed for finishing round- or oval-shaped parts, or rectangular parts with rounded corners.

This double head machine automatically provides a combination cut and color buffing operation for high luster finishing of parts such as electric fry pans, pots, skillets and metal bowls. Depending on part size, shape and finish desired, production rates of from 60 to 150 finished parts per hour can be achieved on this machine.

One unique feature of the machine is the automatic control of finishing wheel pressure to suit part configuration requirements. Air line pressure directed to cylinders controlling the wheel contact pressure is automatically varied when contact surfaces change from flat to radius configurations.

The machine illustrated performs buffing and coloring operations on electric fry pans. The machine occupies a floor space of 4′ by 5′ and is 5′ high. Both the buffing and coloring lathes are powered by 10-hp motors.

Acme Manufacturing Company, 1400 East Nine Mile Road, Detroit 20, Michigan.

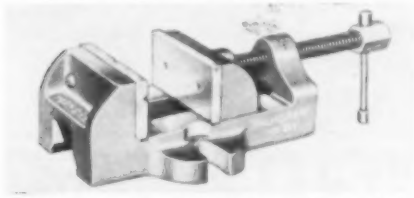
Use postpaid card. Circle No. 56

## PRESS VISE DESIGNED FOR LIGHT GRINDING

A new Palmgren No. 120 drill press vise is designed for light grinding, drilling, tapping and assembly work.

It is provided with mounting lugs for convenience in bolting to a machine table. The vise has 1½" jaw width, opens 1½" with removable ground steel jaw plates 1" deep. One plate is plain; the other is V-grooved horizontally and vertically for holding round work.

The No. 120 vise is accurately machined of semi-steel gray iron castings, and the adjusting screw has long bearing in vise body.



Chicago Tool and Engineering Company, 8383 South Chicago Avenue, Chicago 17, Illinois.

Use postpaid card. Circle No. 57

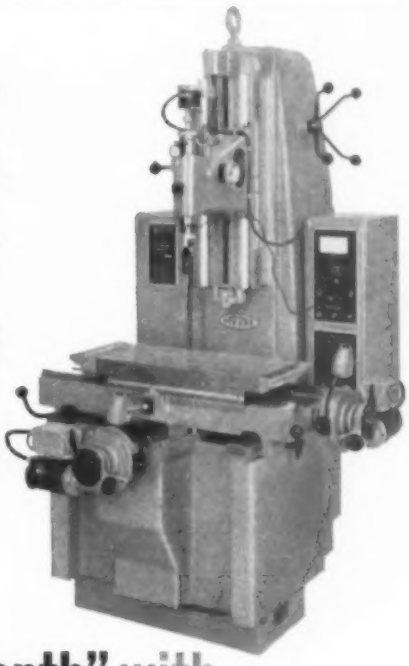

### Accuracy of Positioning

**Longitudinal Travel:**
Greatest error in any inch ..... 15 millionths
Greatest error in any 18 inches ..... 35 millionths

**Cross Travel:**
Greatest error in any inch ..... 15 millionths
Greatest error in 11 inches ..... 35 millionths

**Squareness:**
Compound slide ..... 20 millionths
Travel, spindle housing ..... 50 millionths in 17"
Travel, spindle ..... 30 millionths in 2¼"

**Spindle Axis:**
Runs true ..... within 3 millionths



# These users measure to one-third of a "tenth" with Moore Universal Measuring Machine

The tolerances shown at the top of this page will be proven in front of you before final acceptance of the machine, as it was with each customer shown at right.

These users will also attest to the advantages of this machine: its capacity for ultra-precise measuring and inspecting of larger workpieces; the choice of an electronic indicator supported on an accurate, rotatable spindle, or a universal microscope for pickup; a combination of rectilinear and angular positioning, making possible the measurement of the most complex contours. All ways are hardened, ground and lapped steel, fitted to hand-scraped cast iron. Table positioning in two directions of travel is by means of master lead screws. Note motorized lead screw drive, offered as optional equipment.

*Write today for complete details.*

**MOORE SPECIAL TOOL COMPANY, Inc.**
725 Union Avenue, Bridgeport 7, Conn.

Sperry Gyroscope Division, Sperry Rand ..... Mineola, New York
Eonic, Inc. ..... Detroit, Michigan
Dow Chemical Company ..... Rocky Flats, Colo.
Massachusetts Institute of Technology ..... Cambridge, Massachusetts
DeVlieg Machine Company ..... Royal Oak, Mich.
Douglas Aircraft Co., Inc. ..... Charlotte, N. C.
AC Spark Plug Division, General Motors ..... Milwaukee, Wisconsin
Sangamo Electric Company ..... Springfield, Ill.
University of California ..... Los Alamos, N. M.
Raytheon Manufacturing Company ..... Andover, Massachusetts
Kollsman Instrument Corporation ..... Elmhurst, New York
A. C. F. Industries, Inc. ..... Albuquerque, N. M.
General Electric Company ..... Richland, Wash.
Naval Ordnance Plant ..... South Charleston, W. Virginia
Calmur Machine Tool Corp., Ltd. ..... England
North American Aviation, Inc. ..... El Segundo, California
University of California ..... Livermore, Calif.
Bendix Aviation Corporation ..... Kansas City, Mo.
Chandler Evans Corporation ..... Hartford, Conn.
Mason & Hanger—Silas Mason Co., Inc. ..... Amarillo, Texas
International Business Machines Corp. ..... Owego, New York
Union Carbide Nuclear Co. ..... Oakridge, Tenn.
*University of California ..... Livermore, Calif.
*General Electric Company ..... Schenectady, N.Y.
*Dow Chemical Company ..... Denver, Colorado
*Bendix Aviation Corporation ..... Kansas City, Kansas
Federal Products Corporation ..... Providence, Rhode Island
*Union Carbide Nuclear Co. ..... Oakridge, Tenn.

*REPEAT ORDER

**ADD MOORE TOOLS TO YOUR TOOLROOM**

JIG BORERS • JIG GRINDERS • MEASURING MACHINES • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

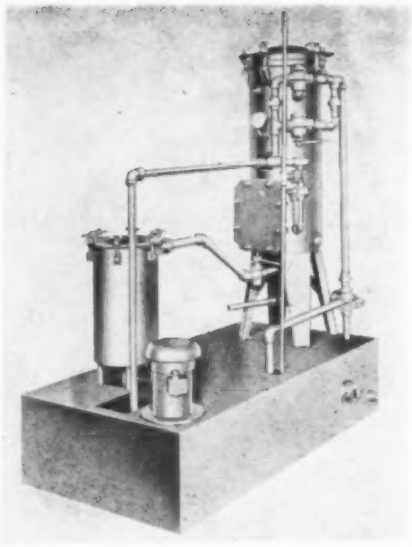
Use postpaid card. Circle No. 234

### CLARITY, LOW OPERATING COST CLAIMED FOR FILTER

A diatomaceous earth electrospark machining filter provides a very high degree of clarity at low operating costs, according to the manufacturers, Olson Filtration Engineers.

Instead of filtering oil from the receiving tank to the electrode only, as economy reasons dictate is desirable when a cartridge-type filter is used, this unit filters all oil supplies without prohibitive costs.

Daily backwashing and precoating the Olson filter put what amounts to a new filter into operation every day. Machining operations can be completed without stopping to change a cartridge.



The low cost of diatomaceous earth adds to the unit's economy of operation.

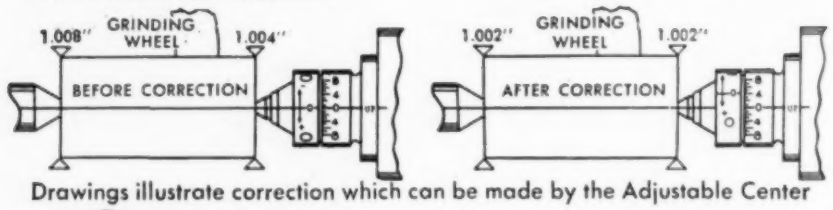
Olson Filtration Engineers, The American Laundry Machinery Company, Cincinnati 12, Ohio.

Use postpaid card. Circle No. 58

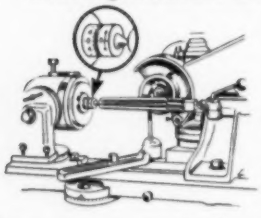

NEW . . . fast, easy CENTER ALIGNMENT for GRINDERS

Center being used on grinder

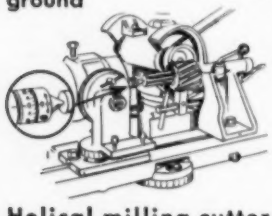
The Enco Micro-Set® Adjustable Center




Drawings illustrate correction which can be made by the Adjustable Center



Taper reamer being ground



Helical milling cutter being reground

- Permits TRUE work alignment from tailstock or headstock on: cylindrical grinders, cutter grinders, gear shavers, lathes and tracer attachments.
- Saves one half the setup time.
- Ends hit or miss table adjustments to obtain precise alignment.
- An inexperienced operator can get a precise alignment—easily—in seconds.
- Quickly pays for itself in time and scrap savings.

**MORSE TAPER**
No. 2—$49.50, No. 3—$61.50, No. 4—$76.00.

**BROWN & SHARPE**
No. 6, 7—$53.00, No. 8, 9—$65.00, No. 10, 11—$85.00.

**JARNO**
No. 6, 7—$53.00, No. 8, 9—$65.00, No. 10, 11, 12—$85.00.

**STRAIGHT SHANK**
¾"—$56.00, 1"—$68.00, 1¼", 1½"—$80.00.

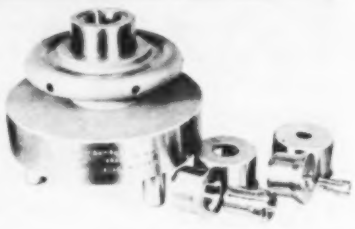
We also manufacture Precision Lathe Turrets and Tiny-Titan Magnet Base Holders.

Enco MANUFACTURING CO. Dept. 821, 4520 W. Fullerton Ave. Chicago 39, Ill.

*Write for catalog and nearest distributor.*

**Use postpaid card. Circle No. 235**


### SPECIAL COLLET CHUCK SPANS RANGE 1⅝" TO ¼"



A special Erickson model 501 collet chuck spans the entire range from 1⅝" to ¼". Like the Erickson standard model 501 chuck, the special uses standard 500-series collets to cover sizes from 1⅝" to 1".

Two special insert noses, however, extend the capacity by permitting use of standard 400 series and 100 series collets in the size range from 1" down to ¼". Each collet collapses a full 1/32". Special collets are available in decimal sizes within the 1.625" to .218" range.

The standard hardened-steel collets used in the new chuck are slotted at both ends, and employ the Erickson double angle design. Two camming surfaces collapse the collet over its entire length as the nose piece is drawn in. This enables the collet to grip drills and end mills on their flutes as well as on straight shanks. Collets are self-releasing.

Erickson Tool Company, 34350 Solon Road, Solon, Ohio.

Use postpaid card. Circle No. 59

## ADD LINE OF REINFORCED RESINOID TYPE 27 WHEELS

Atlantic Abrasive Corporation has added a line of reinforced resinoid depressed center disc wheels, Alpha wheels, to supplement their regular stock of grinding wheels.

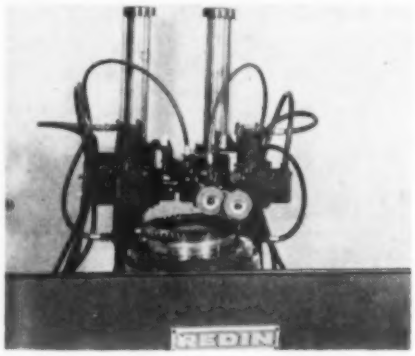
Designed for fast grinding action wherever quick metal removal is required, they are principally used in fabricating shops for removing excess metal, beveling edges, and grinding welds; and in foundries for notching and general trimming.

Alpha wheels are available in 7" and 9" diameters; ⅛", 3/16", ¼", and ⅜" thicknesses; ⅞" depressed center hole. They are manufactured in grain sizes from 14 to 120.

Atlantic Abrasive Corporation, 135 Pearl Street, South Braintree 85, Massachusetts.

Use postpaid card. Circle No. 60

## ANGULAR ADJUSTMENT ON GEAR DEBURRING MACHINE




Redin's new Model 24 universal gear deburring machine provides angular adjustment to the work and wheel spindles which makes it adaptable for spiral bevel gears as well as for spur, helical, straight bevel, and worm gears.

Maximum swing is 24". The work spindle has a 6" hole to accommodate gears and pinions with integral shafts.

Redin Production Machine Co., 2433 Twentieth Street, Rockford, Ill.

Use postpaid card. Circle No. 61

## GAGE ATTACHMENT CHECKS SQUARENESS-OF-FACE

A new squareness-of-face attachment is available to check smaller parts on B-21 Bryant-Ex-Cell-O bench-type thread gage.

This attachment is designed to check the squareness of faces and shoulders of parts in relation to internal or external threads or diameters of the part. The gaging segments hold the part firmly on the flanks of the thread in a manner similar to that of the mating part in assembly.

*continued*

*Are you buying free rides for a lazy coolant?*

Does your coolant or oil breeze through a grinding machine without contributing to faster cutting, better finish, longer wheel life?

Is it responsible for poor accuracy, poor chip-settling and rust? Does it foam? Is it tough on the hands?

If so, switch to White & Bagley *lively* coolants. There's not a lazy drop in a tankful!

**For a 1¢-a-gallon** all-purpose coolant, get W&B Chemical Concentrates: W&B 1500 for steel (and titanium) W&B E-55 for steel, cast iron, nonferrous metals. You get extremely keen grinding action.

**For grinding AND cutting,** get W&B Lubricant 1888 — A high detergent, water soluble for better finishes.

**For very tough** grinding and cutting jobs, get W&B HD Soluble 2213. Gives exceptional support and cooling.

**For critical thread, gear, tap and form** grinding, get W&B Grinding Oil 1572. It's a standard of the industry.

For facts about *lively, hard-working* coolants, write . . .
The White & Bagley Co., 88 Foster St., Worcester, Mass.

**THE WHITE & BAGLEY CO.**

Worcester, Massachusetts · Detroit, Michigan

*Originators of Grinding Lubricants*

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Indicators are available with graduations reading to either .0005" or .0001". Accuracy and repeatability are within .0001".

The Bryant-Ex-Cell-O squareness-of-face gage is adjustable vertically for different part heights. The contact arms are adjustable horizontally to suit various face diameters and contact finger adjustments provide a fine setting.

The attachment is fully compensated to show total indicator readings of out-of-squareness of surfaces in relation to either internal or external threads or diameters.

Ex-Cell-O Corporation, Greenville Plant, 945 E. Slater St., Greenville, Ohio.

Use postpaid card. Circle No. 62

### TAPE BANDAGE MAKES WRIST, FINGER GUARDS

A special tape, Guard-Tex, has been designed to protect wrists and fingers in the handling of sheet metal or other sharp objects. It may also be used for finger protection in operations such as grinding and buffing.

General Bandages, Inc., 8300 Lehigh Avenue, Morton Grove, Illinois.

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SUPERIOR MAKES HONING POSSIBLE AT LOWER COST

MODEL VH SUPERIOR HONING HEAD

Adaptable to most drill presses. Designed for honing work too heavy to hold on machine, and to have all the convenience of operation of Superior Honing Machines. Range 1/8" to 3". Size dial on bottom of head permits the increasing or decreasing of size while in operation.

No stopping of spindle necessary. Lever releases stone from work and expands stone to same size under spring pressure on next part. Only adjustment necessary to duplicate size is for stone wear.

Stocked in all principal cities.

Send for details and prices.

*Makes any* DRILL PRESS *a* VERTICAL HONING MACHINE

*Superior* MD-1 Mandrel Driver

Rapid, economical hole finishing and sizing with .0001 accuracy. Ideal for die work, bushings, dowel pin holes.

Only the stones contact work piece, assuring long life and preventing marks on honed surfaces.

Permanent type mandrel sizes; .120 to 3.000; available in No. 2, 3 or 4 morse tapers.

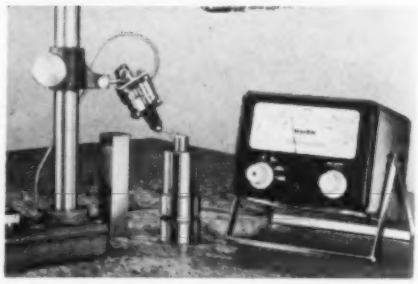
Also MD-4 Mandrel Driver available for 3" to 6" dia. range. All mandrels are interchangeable to Superior honing machines.

SUPERIOR HONE CORPORATION

1031 TENNESSEE ROAD ERWIN, TENNESSEE

Use postpaid card. Circle No. 237


### ELECTRONIC GAGE UNIT REQUIRES NO WARM-UP



The use of transistors and battery power in a new electronic gaging unit, the Electro-Probe, provides high reliability and operation without the warm-up time usually required for precision electronic equipment, according to the manufacturer.

The Electro-Probe is normally powered by a mercury cell battery pack which provides over 1200 hours of continuous or intermittent operation. Optionally the user can power the unit from individual mercury cells, carbon cells, or regular power lines.

All components are contained within the housing of the amplifier, which is the carrying case of the gage. Carrying handles also serve as adjustable legs.

Federal Products Corporation, Providence 1, Rhode Island.

Use postpaid card. Circle No. 64

### PLUG GAGE CHECKS "GO," "NO GO" SIMULTANEOUSLY

An adjustable internal "Snap-Plug" permits both "GO" and "NO GO" to be checked at one insertion of the gage. A simple upward movement of the wrist indicates whether the part is in size or oversize.

The design eliminates the need for many individual cylindrical plug gages by having an adjustable range from 2" to 4". Conditions such as

taper, bellmouth, and out-of-roundness can be readily detected.

Gage pins are interchangeable and replaceable. Carbide tipped pins are available at nominal cost.

Southern Gage Company (affiliate of N. A. Woodworth Company) Erin, Tennessee.

Use postpaid card. Circle No. 65

## STROBOSCOPE DESIGNED FOR SLOW-MOTION ANALYSIS

An electronic stroboscope marketed under the trade name Strobotac® has been designed for tachometry and slow-motion analysis of machines and processes.

A very high intensity light and an ultra-short flash duration are combined, enabling the viewing of fine detail. By this technique, repetitive processes may be analyzed in slow motion, although the process is actually operating at full speed.

The use of a Strobotac in measuring grinding-wheel speed is illustrated above. By use of this means of speed measurement, it is feasible to operate a grinding wheel at an exact point under its maximum safe speed.

General Radio Company, 22 Baker Avenue, West Concord, Mass.

Use postpaid card. Circle No. 66

## DUST RESPIRATOR USES WASHABLE FILTER ELEMENT

A permanent, washable filter element treated with du Pont Thiuram is one of the main economy features of a dust respirator introduced by Glendale Optical Co. The respirator is recommended for protection against nuisance dusts and for paint spraying. Glendale Optical Co., Inc., Valley Stream, New York.

Use postpaid card. Circle No. 67

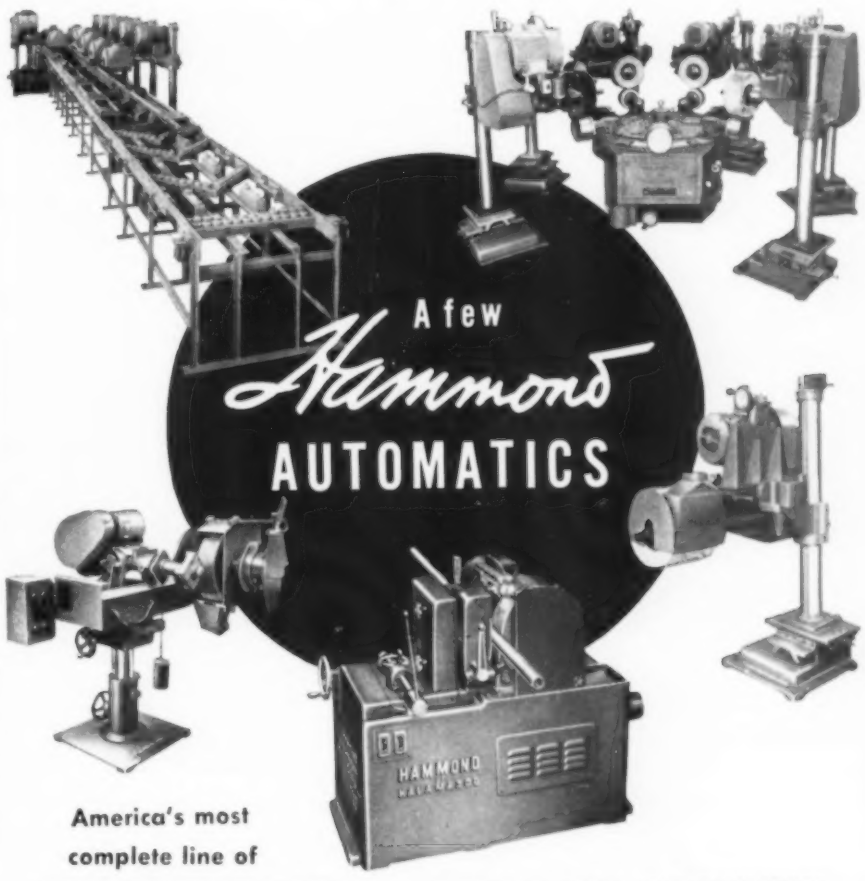
## SMALL DEPTH GAGE GIVES FAST, LOW-COST INSPECTION

A small hole depth gage developed by Unigage Corp. meets a need for fast, low cost, depth inspection in machine and metalwork manufacturing, according to the maker. It is useful for any hole or indentation inspection on parts where depth control is necessary.

The gage is direct reading from zero to one half inch in .001" graduations. The contact will enter any hole down to .062" dia. The gage as illustrated is bench mounted. It may also be removed from the base and used as a hand gage.

The three point support base may be used separately on special gaging applications. It will hold any AGD dial indicator of groups 1 through 3. The indicator can be locked in any

*continued*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1651 DOUGLAS AVENUE KALAMAZOO, MICHIGAN

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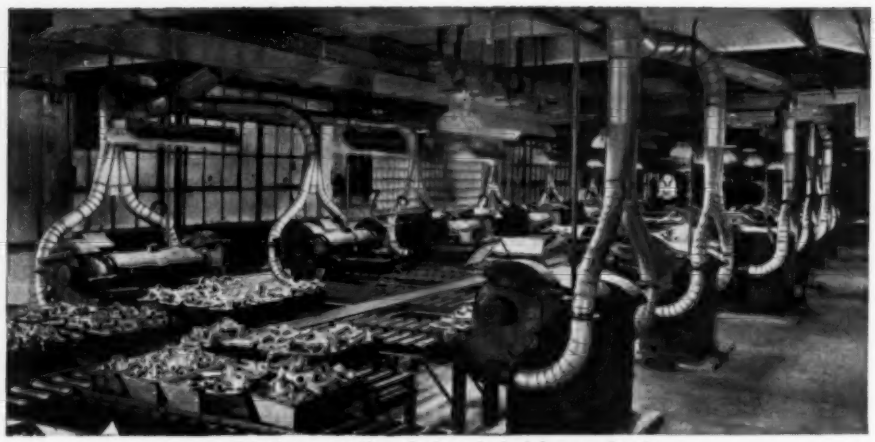

Grinding operation, dust control piping overhead.

# No two dust control problems are alike!

Grinding operation, dust control "down draft" under floor.

Since no two dust control problems are alike, a Kirk and Blum engineering survey determines the exact nature of *your* specific application. It's all part of K & B's *complete* service to assure you the best system for your particular need, all factors considered.

From survey time until the system is completed and in operation, Kirk & Blum handles the entire job with one undivided responsibility . . . a condition only possible when you have *one* source for all service, *one* guarantee for all components.

Write today for the new 52-page K & B Catalog or a no-obligation survey of your particular problem. The Kirk & Blum Mfg. Co., 3124 Forrer St., Cincinnati, 9, Ohio.

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position from vertical to horizontal depending on the requirement. Three neoprene feet are used to prevent slippage and to insure a non-rocking, non-marring mounting.

Unigage Corp., 330 Interstate Road, Addison, Illinois.

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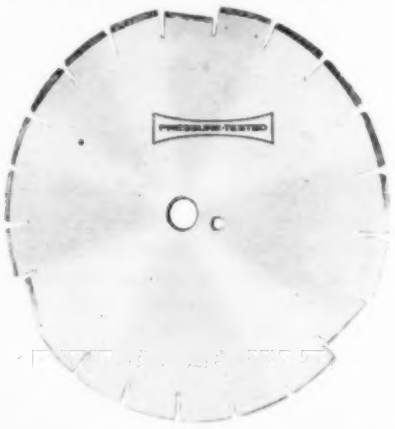
## MASONRY SAW BLADES USE TUNGSTEN CARBIDE BOND



A new series of diamond masonry and concrete saw blades from Diamond Tool Research provides Pressure-Tested diamond grits in a tungsten carbide bond.

Pressure-Tested diamond, according to the manufacturer, makes a significant difference in the ability of the blades to take heavier cuts and cut more footage than competitive blades.

The use of tungsten carbide as a bond is said to increase the efficiency of the blade by preventing the wearing away of the rim before the diamonds.

A special "raker" design built into the rim results in faster cutting and eliminates undercuttings by removing or "raking" out the chips of concrete.

There is no additional cost for Pressure-Tested diamonds. Blades are available in all standard diameters and thicknesses. Special sizes can be supplied.

Diamond Tool Research Co., Inc., 380 Second Ave., New York 10, N.Y.

(The above release was originally printed with the wrong picture in December, 1960. We are glad to reprint the release with the proper picture.)

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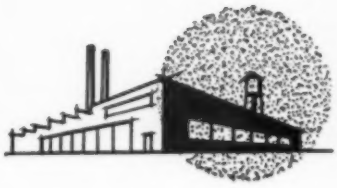
• • •



# News from the Industry

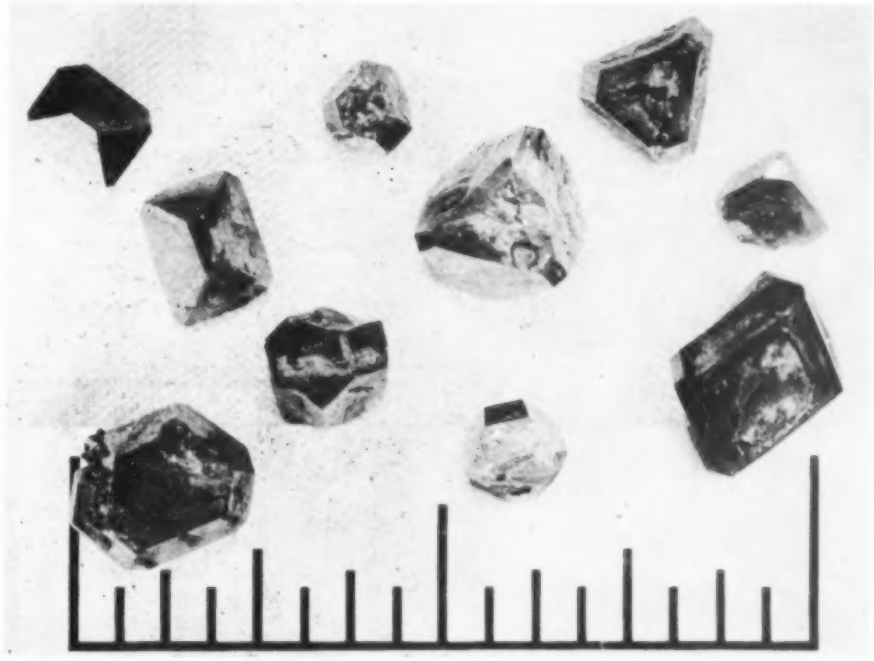
## GENERAL ELECTRIC MAKES CARAT-SIZED DIAMONDS

"For the first time in history, man has made large diamonds," according to Dr. Guy Suits, General Electric vice president and director of research. "The large diamonds are over a carat in size. They are dark in color and, because of structural imperfections, they are not yet of sufficient mechanical strength for industrial use," Suits said.

This scientific feat was achieved at the General Electric Research Laboratory in Schenectady, where the first man-made diamonds were announced in 1955. "These new, large diamonds," Suits reported, "are the latest milestone in a high-temperature, high-pressure research program that we have pursued since our initial success in converting common graphite into diamonds."

Suits pointed out that the large diamond work is still in the early development stage. "It is impossible to predict when we will succeed in making large diamonds with mechanical properties comparable to our small diamonds, which have proved to be superior to natural diamonds for many industrial applications," Suits said. Suits observed that GE industrial diamonds are of the utmost strategic importance today. "The major source of natural diamonds is the Congo, and the uncertain conditions there demonstrate how fortunate it is that industry can turn to man-made diamonds for many of its needs," he said.

General Electric's diamond research program is directed by Dr. A. L. Marshall and A. J. Nerad.



**A group of carat-sized diamonds made by scientists of the General Electric Research Laboratory in Schenectady, N.Y. seen against a one inch scale. These large diamonds are dark in color and are not yet of sufficient mechanical strength for industrial application. They are the latest advance in GE's diamond-making research program.**

Drs. Francis P. Bundy, Herbert M. Strong, Peter Cannon and Robert Wentorf of the Research Laboratory, and H. P. Bovenkerk, now with the Metallurgical Products Department, are the leading scientists responsible for the progress of this program.

"We have enjoyed steady advances in our diamond-making program," Suits revealed. "Our first diamonds were dark in color, and only thousandths of a carat in size —about the size of fine grains of sand. But this size is needed for many cutting, grinding, and polishing applications in industry. We succeeded in making the transition from laboratory to full-scale production of these small diamonds in two years. Moreover, we learned how to 'tailor-make' them for optimum effectiveness in industrial applications. As a result, they outperform natural diamonds in this category," Suits said. Millions of carats of these industrial diamonds have been manufactured by General Electric's Metallurgical Products Department in Detroit since 1957.

In response to industrial needs for larger diamonds, General Electric has succeeded in increasing its control over the size, mechanical

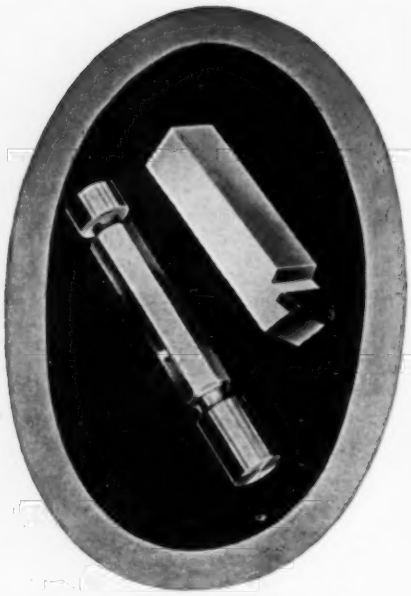
*continued*

quality, and shapes of its diamonds, according to Suits. He announced for the first time that "General Electric can now make, in the laboratory, diamonds up to 1/10 of a carat in size that are of excellent industrial quality." Stones of this size are needed for metal-bonded diamond wheels and saws. "However, these 1/10 of a carat diamonds are not yet available commercially," Suits pointed out.

Industry also uses diamonds in full carat ranges for drills, dressing tools, dies, and single point cutting tools. "If General Electric can perfect the mechanical structure and improve the strength of its new, carat-size diamonds, the Company will be able to compete with natural stones in full industrial range," according to John D. Kennedy, general manager of GE's Diamond Production Business Section in Detroit.

**A. J. Nerad, manager of General Electric's diamond-making research program, holds a carat-sized diamond recently made by scientists of the GE Research Laboratory. In the foreground is a mound of small man-made diamonds.**

Kennedy also commented upon the strategic and political significance of GE diamonds. In his words, "The supply of diamonds is a critical factor in industry, and man-made diamonds can nullify the otherwise serious threats of depletion of the natural sources or of arbitrary exclusion from those sources."

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Virgin Diamond particles, graded in our own laboratories, are uniformly dispersed in the exclusive Hyprez vehicle for maximum cutting action. They produce finer results faster on every finishing job... Your nearby Hyprez distributor will help you solve any lapping or polishing problem that may arise.

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3640 Llewellyn St., Cincinnati 23, Ohio

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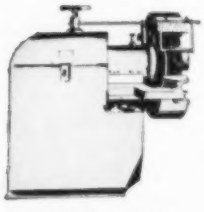
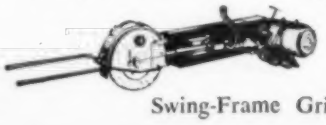


General Purpose Grinder

Vari-Speed Single End Grinder



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## Changing Faces . . .

B. J. Herron

J. R. Householder

R. E. Oliver

L. A. Stedman

Howard Grivna

B. J. Herron, district sales manager at Thor's San Francisco branch the past four years, has been appointed district sales manager of the Seattle branch of Thor Power Tool Company, 175 North State St., Aurora, Ill., with J. R. Householder succeeding him at San Francisco.

Richard E. Oliver has been appointed head of the Purchasing Department of National Automatic Tool Co., Richmond, Indiana. He succeeds Paul G. Nolte who retired September 30 after 45 years of service at Natco.

John V. Quinn has joined United Aircraft's Norden Division as factory superintendent. He will be located at the division's Milford, Conn., department until the manufacturing area is set up in the new plant in Norwalk, Conn.

George F. Marriott has been named superintendent of the Indianapolis plant of Jones & Laughlin Corporation's Stainless and Strip Division. He joined J&L in 1929.

Pangborn Corporation, Hagerstown, Maryland, has promoted Linwood A. Stedman manager of the New England district, with offices in Springfield, Massachusetts.

He succeeds John H. Connolly, who retired recently after more than 22 years as district manager.

Howard Grivna has been appointed as design engineer for Timesaver Sanders, Minneapolis, Minnesota.

E. F. Mitchell, vice president and general manager of Vitrified Wheel Company, Westfield, Massachusetts, has announced the selection of Paul G. Bostley as the company's New England representative.


**"Abrasive & Carbide Cutting Tool"**

Specialist with large following in the East, seeks one additional major line. Must be partially established. Have office and warehouse facilities.

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**100 lbs. of motor . . .**

**216 lbs. of man . . .**

**New B & S Magnetic Chuck holds both, with ease!**

If you want a magnetic chuck with tremendous holding power — this is it!

Brown & Sharpe's new rotary permanent magnet chuck gives you a big new grip, so strong that this chuck can be used for turning and other substantial cutting operations — as well as for grinding and polishing work.

Ask your Brown & Sharpe distributor for a "personal magnetism demonstration!" Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

▶ **"Standing test" dramatizes power** of new Brown & Sharpe chuck to hold heavy work. Motor frame is two feet long, with only about 7½ sq. inches of its end surface contacting the chuck. Job shown is grinding operation on both ends. Tolerance: .0002" overall.

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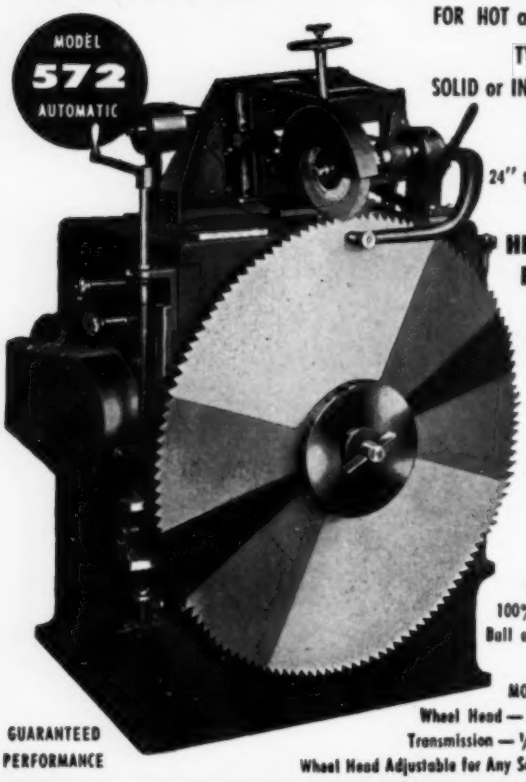
FOR HOT and COLD SAWS

MODEL 572 AUTOMATIC



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The accurately ground alloy steel shank is hardened above Rockwell "C" 60 for extreme resistance against nicking. A center that will remain free from nicks will always fit the machine more accurately.

The design of the shank avoids damage to the tool when it is removed from the machine.

Balas Carbide Centers are unconditionally guaranteed. Carried in stock in Morse Taper, Brown and Sharpe Taper, Jarno Taper, full centers and half centers in all popular sizes. Write for literature and prices.

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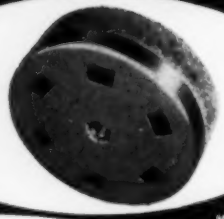
FLARED CUPS

## SAFETY FIRST



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### A.I.T. DIAMOND TOOL SHOWS TRAVELING "DIA-MO-RAMA"

The first showing of a traveling "Dia-Mo-Rama," a presentation of diamond wheels in use on grinding machines, was staged recently by the A. I. T. Diamond Tool Company, Skokie, Illinois, at the Schroeder Hotel, Milwaukee, Wisconsin.

Included in the program was a talk, "Man-Made Diamonds—Past, Present, and Future," by Norman Leventhal, of General Electric's Metallurgical Department, Detroit, Mich.

Machines used in the presentation were a new tool and cutter grinder and a new surface, both introduced by Covel Manufacturing Company, Benton Harbor, Michigan. Man-Made Diamond wheels with A.I.T.'s new "49-er" resin bond were used.

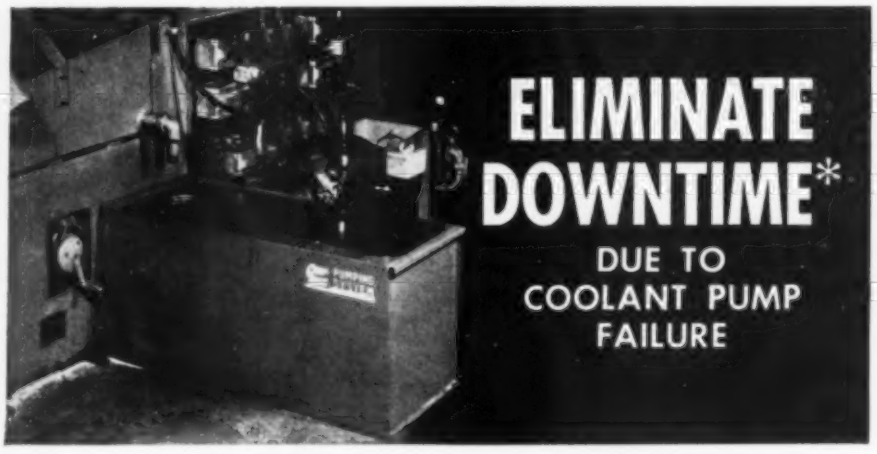
Plunge grinding with full flow of coolant on the surface grinder, the wheels removed up to .032" per pass in slow traverse, with wheel loss reported equivalent to that in removing the usual .001" per pass in dry grinding. Dry grinding was also demonstrated.

Engineers participating in the question-and-answer period concluding the demonstration were Elmer Hop, and C. George Mattusch, Covel; Raymond Schwartz, Hammond Machine Builders, Kalamazoo, Michigan; and Ken Hutton, of Anocut Engineering Company, Chicago, Illinois.

Skip Youman, general sales manager for A.I.T., was host for the occasion, assisted by Leroy Weiss, assistant sales manager, and Robert I. Youman, director, Glass Products Division, from A.I.T.

### NEW PLANT DOUBLES CAPACITY

Jowitt and Rodgers Company, manufacturers of surface grinding wheels, segments and discs for the metalworking field, have moved into a new plant at 9400 State Road, Philadelphia, Pennsylvania. The firm had formerly been located at 1017 N. Front St., Philadelphia. The new building doubles the firm's facilities to meet its growing volume. • • •

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**CUTTING FLUID**
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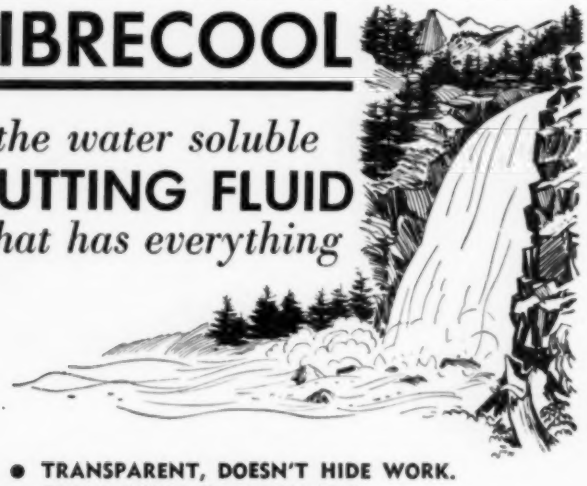

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**METAL WORKING LUBRICANTS**

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**re·li'a·ble:** That which can always be counted upon to do what is expected or required

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**Cratex reliability lowers costs**

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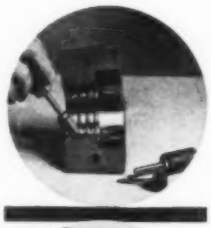

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**DUSTKOP STOPS DUST**

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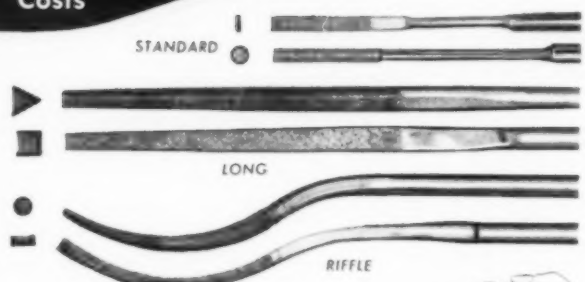
**Remove Stock Faster, Save Man Hours, Lower Your Costs**

28 SIZES AND SHAPES
COARSE, MEDIUM OR FINE MESH




For fast stock removal, prepolishing or final polish, Engis Diamond files save costly man hours by operating at higher speeds. The accurately graded diamond particles are metal bonded with points exposed for best results. Sizes, shapes and grits are especially adapted for use on carbides, heat treated steel, ceramics and all hard coated metals.

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Although Engis Diamond Files can be used manually, cutting action is much faster and more precise when used with the Di-Profiler Reciprocating Hand Machine, which provides variable speeds and length of stroke for working all surfaces and fine detail.

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**ENGIS EQUIPMENT COMPANY**
**431 South Dearborn Street, Chicago 5, Ill.**

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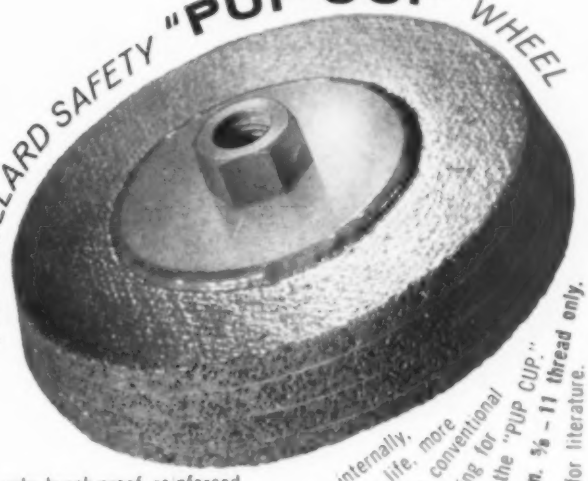
# THE BULLARD SAFETY "PUP CUP"* WHEEL



The only break-proof reinforced cup wheel available with proven design and performance. Quadruple fibre glass reinforcement internally, externally which commands longer life, more usable abrasive . . . and it costs less than conventional cup wheels! For fast, safe snagging for all applications, specify the "PUP CUP." Size 6"/5½" x 1¼ – 1½" rim. ⅝ – 11 thread only. Please write for literature.

⅝ – 11" nut bonded externally

*Patent Pending

Manufactured only by

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SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available

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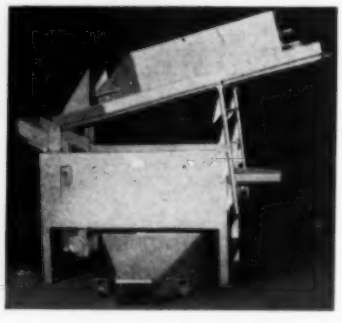
## Fast, low-cost AUTOMATIC Screen SEPARATING Machines

Model SS-3S

- Save 1/3 or more in handling time.
- Eliminate hand operations.
- Speed tumble finishing and reduce cost per piece.



Rampe machines are noted for their simple, straight-forward operation; Model SS Screen Separators are particularly easy to use. Screen angle is variable 3° to 7°. Convenient handwheel permits speed adjustment from 145 to 350 reciprocations per minute. Square screens are easily removable and interchangeable in selected mesh sizes. Simple manual start-stop buttons. Five models are available: in-line or compact (illustrated) types. Eliminate costly hand operations:

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# TURNABLE

the diamond tools with a NEW TWIST!

*Cost No More—Last Longer!*

*A flick of the* **wrist**
*and*
*your diamond is*
**turned!**

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**BUILT-IN TURNER!**

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Shank and diamond sizes for all grinders. Send for FREE detailed literature. Distributor inquiries invited.

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## ...LOWER "PER UNIT" COSTS

**ALPHA**
GRINDING WHEELS

Designed for fast action wherever quick metal removal is required. Their longer cutting life means more metal removed per disc wheel – reducing "per unit" production costs. And, because of this more efficient cutting action, Alpha disc wheels do not cause operator fatigue.

Made from abrasive grain and resinoid bond, Alpha disc wheels are strong and durable. Triple reinforcement provides greater safety while in operation.

Alpha grinding disc wheels are manufactured in 7 and 9 inch diameters in a complete range of grain sizes from 14 to 120.

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A DIVISION OF ABRASIVE PRODUCTS, INC.
South Braintree 85, Massachusetts

STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS
CONES • PLUGS • MOUNTED WHEELS AND POINTS

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## Don't Miss these Features

# *Grinding and Finishing*

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## Coming Next Month

**Basic Rules for Cutter Grinding**

Often passed from grinder to grinder the rules or benchmarks for good toolroom grinding are extremely beneficial to everyone concerned with this type of grinding.

**Friability Testing of Man-Made Diamonds**

Testing for friability is extremely important to the grinding efficiency of the particles. Man-made diamonds are controllable within desirable limits thus making the test even more important.

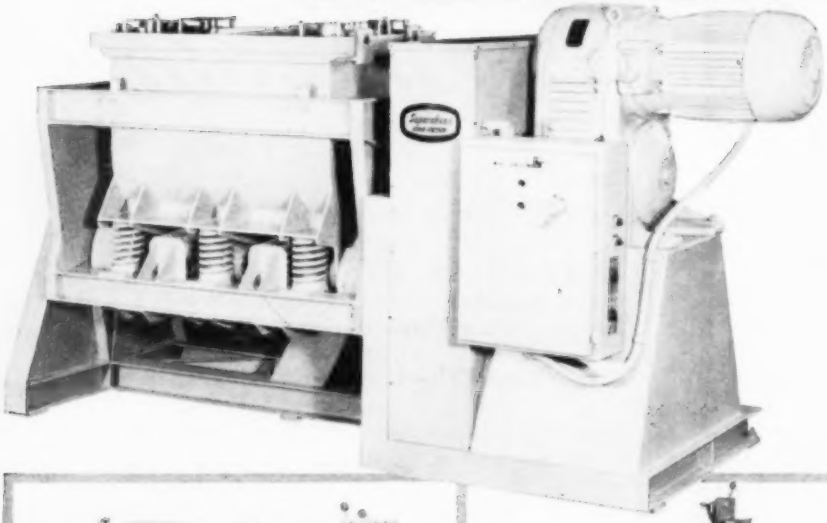
**State Safety Codes for Grinding**

Just how far have our states gone in the codes for safety? This is the question which has been very important to grinding users. All 50 states were contacted in order to evaluate the situation.

## UP TO 100 TIMES FASTER FINISHING WITH

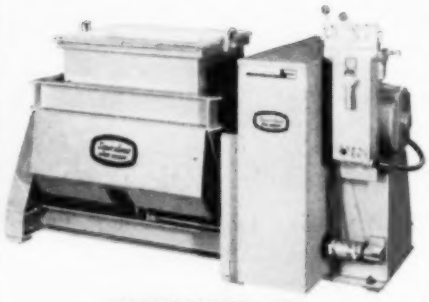
# ALMCO

# VIBRASHEEN



## ALMCO'S FULL LINE OF NEW VIBRASHEEN MACHINES

**MODELS VT-717 — 712**
**(18 and 12 cu. ft. capacities)**
**Ideal for large components requiring fixtures or a large volume of smaller parts.**

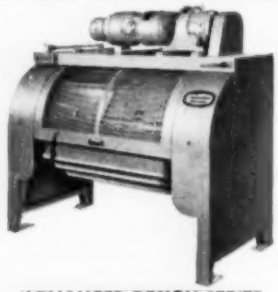


**MODELS VT-77 — 75**
**(7 and 5 cu. ft. capacities)**
**Efficiently deburrs and finishes parts in quantities suitable for medium size production runs.**

**MODELS VT-72 — 71**
**(2½ and 1 cu. ft. capacities)**
**Popular unit for firms requiring precise finishing of a wide variety of parts in small lots.**

**MODEL VT-70**
**(3 qt. capacity)**
**Bench model ideally suited for miniature bearings, extremely small gears, stampings, etc.**

## WORLD'S LARGEST LINE OF PRECISION FINISHING EQUIPMENT



**ADVANCED DESIGN SERIES**
**Thirteen models are available in this series featuring capacities of from 5 to 40 cu. ft., each equipped with variable speed drives. (Infinite from 6 to 30 rpm's.)**

**SPINDLE MACHINES**
**Designed for fast precision finishing of complex, high quality components such as gears, bearing cages, spline shafts, rotors, on continuous production "in line" basis.**

**CUSTOM DESIGN BARRELS**
**Special large diameter barrels are available to accommodate extra large parts. Fixtures hold parts to assure complete, precise finishing of all crevices and surfaces.**

***SEND FOR NEW ALMCO CATALOGS ON BARREL FINISHING MACHINES MEDIA, AND COMPOUNDS***

**ALMCO**

**PRECISION FINISHING**

*Queen Products Division • King-Seeley Corporation*

**132 E. Main Street, Albert Lea, Minnesota**

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# Economic Problems? The Solution Is Up To You!

There have been few times in the history of our country when its life has been so desperately imperiled. Our perils are a two-pronged pincer: Domestic and International. Let us be concerned with the domestic perils and basic, underlying causes.

1. There has been, and is continuing, a silent deterioration of our production equipment and our productive facilities. This does not permit us to compete successfully with imports, nor does it enable us to produce so economically, and of such quality, that prices may be reduced.

2. An unbalanced labor situation results in constantly higher wage costs with no commensurate gain in overall output. This applies to both productive and nonproductive labor. This situation will worsen.

3. The programs of government spending have only added fuel to the inflationary fire, and aggravated the two previously mentioned evils.

4. A lack of genuine respect in Washington for industry and vice versa. This absence of cooperation is most vividly shown by the new administration's desire to cure our present ills singlehandedly, and by the simple expedient of pumping more money into the blood stream.

5. A definite apathy on the part of business to face up to the immediate problems and endeavor to find a solution. There is too much running to, and looking to Washington when the going gets rough.

These problems have been discussed before and the usual recommendation is that these matters be solved jointly by government and industry. Only industry can make jobs, can meet competition, can build a healthy economy. All that government can do is to provide the right climate.

Industry, unfortunately, has been more vocal than active about its problems. It has not yet realized, although many companies are coming to it, that it must solve its own problems as they pertain to each individual business. This means that your business is your business, your labor problems, your markets, your production equipment, your facilities and your thinking, and your brawn that will solve the problems for you.

The solution to any economic problem lies in you. Do not look to government. And if our country lies in economic peril, it behooves each and every company to make certain it's as strong and healthy as it can possibly be, and as well equipped and as productive as American brains and muscle can make it. If we don't, the lights will go out, one by one, and the communist lamps will be lit, one by one.

Wm. F. Schleicher

Vice President & Editorial Director

# Tests prove...40% greater wheel efficiency with SND selected natural diamonds

*Lowest wheel cost and peak performance* are assured — when you specify SND (Selected Natural Diamonds)—the most advanced development of diamond technology—for your diamond wheels. The superiority of SND (Selected Natural Diamonds) over man-made diamonds of comparative shape and size has now been proved indisputably by realistic carbide grinding tests under a broad range of job-use conditions *that apply in your own shop.*

Representative performance data—charted here from just one of the extensive test series—shows that SND-RB (Selected Natural Diamonds-Resinoid Bond) under this set of conditions performs with 40% greater grinding efficiency and greater freedom of cut than equivalent man-made RVG (Resinoid Vitrified Grit) diamond abrasive used in the same type of peripheral wheels.

This means that SND insures longer wheel life...greater wheel productivity...faster, cooler cutting in precision grinding. The results of other tests, conducted under varying conditions for both peripheral and flaring cup wheels, are equally important to you. A report of the test series will be sent to you gladly, on request.

Your diamond wheel supplier has the knowledge and experience to help you select SND Grit in wheels best suited to your particular requirements.

To keep up to date on latest developments in industrial diamond technology—including indisputable test results that prove SND superiority—write for technical bulletins.

| GRIT TYPE AND SIZE | CROSS FEED | DOWN FEED | SPINDLE POWER CUT | GRINDING EFFICIENCY RATIO | COMPARATIVE EFFICIENCY |
|---|---|---|---|---|---|
| SND-RB (150) | .042" | .002" | 690 Watts | 32.3 | 140% |
| MAN-MADE RVG (150) | .042" | .002" | 708 Watts | 23.2 | 100% |

**PERFORMANCE RESULTS**

Wet Grinding of Grade 44A with DIA1 Resinoid-Bond Wheels (5" x 3/16" x 1 1/4") at 4200 R.P.M.* Spindle Speed, 45 ft./min. Table Speed

**4200 R.P.M. Spindle speed simulates grinding with 6" peripheral wheels at 3600 R.P.M. (5500 S.F.M.)*

*SND-RB (150) performs with 40% greater efficiency at lower spindle power... proof that this type of abrasive provides longer wheel life and faster, cooler cutting than equivalent man-made diamonds.*

★ENGELHARD HANOVIA, INC.★
INDUSTRIAL DIAMOND DIVISION
113 ASTOR STREET • NEWARK 2, NEW JERSEY

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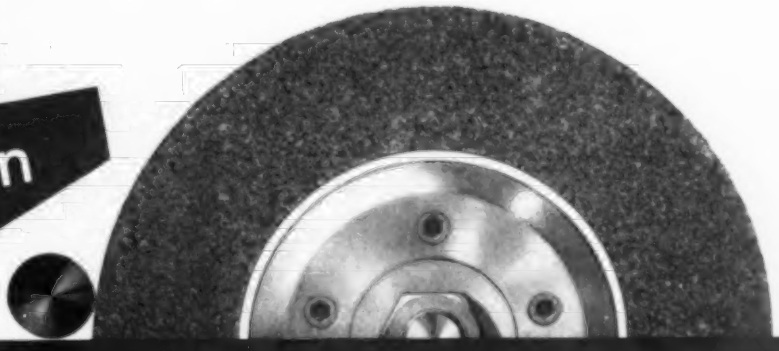
# WALTHAM "Variable Density"

## CYLINDRICAL GRINDING WHEELS

### Reduce Cylindrical Grinding Costs

PRODUCE UNIFORM Grinding Action



## ALL THE WAY TO THE FLANGES

**DRESSING**

All the way to the flanges — more pieces per dress as Variable Density **grinding action is uniform all the way down.**

**CORNERS**

Uniform action all the way to the flanges — sharp corner holding, as Variable Density adjusts for changing contact area.

**FINISH**

Uniform micro-inch readings all the way down to the flanges.

•

**Many grinding departments have found Waltham 14A602-K17V2 an exceptionally good wheel for Cylindrical Grinding. Note: 17 indicates Variable Density with 7 structure.**

**Waltham Variable Density Wheels are made from 16" through 36" as operations require.**

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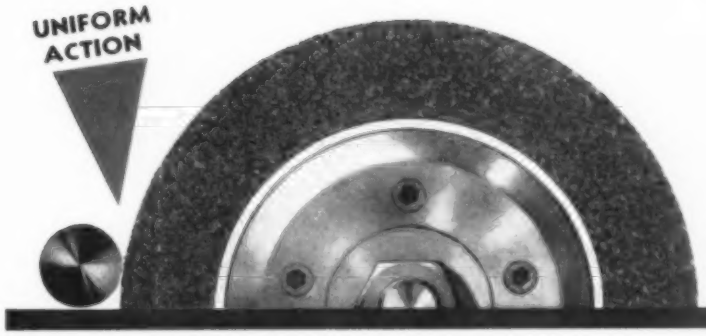



**As Grinding Wheels Wear Down** the constantly smaller diameter creates two changes in grinding action —

**the surface feet per minute gradually become lower,**

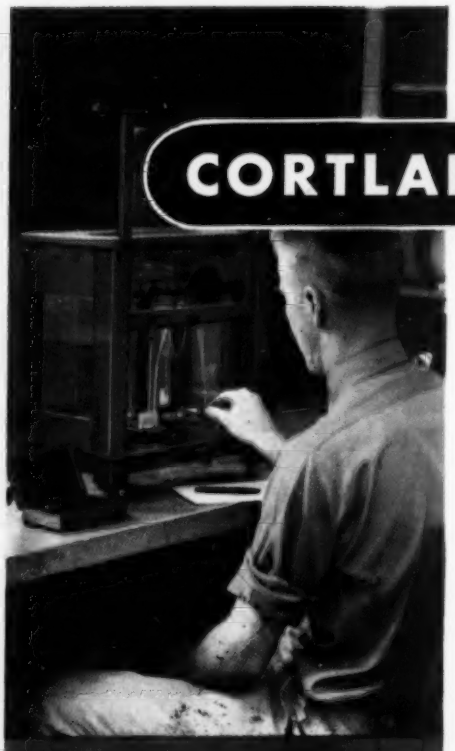
**the arc of contact between wheel and work gradually becomes smaller.**

**Waltham Variable Density** automatically compensates for these ordinary wheel conditions, with uniform action all the way to the flanges.

**Yes — All the way to the Flanges!**

## Waltham Grinding Wheel Company • ESTABLISHED 1880 WALTHAM, MASSACHUSETTS

# CORTLAND TOOL ROOM WHEELS



## by craftsmen . . . for craftsmen

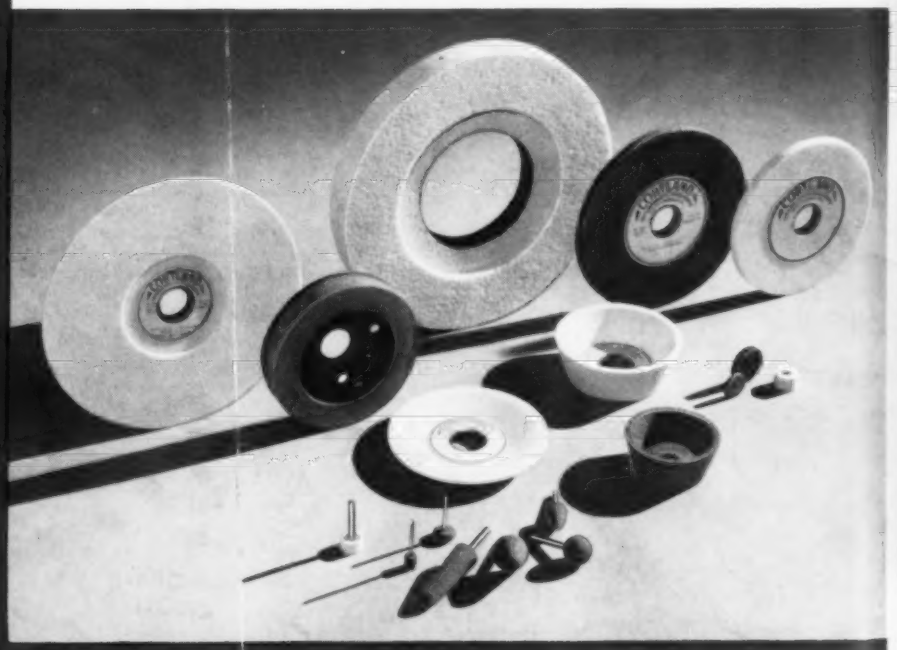
The rigid requirements of tool room operations are readily met with Cortland Tool Room Wheels.

This is true — basically — because we ourselves insist on only the highest quality materials. We have the knowledge and experience necessary to process these ingredients to the precisely correct grain, grade and structure combinations.

And we have all the equipment and facilities to produce — consistently — products that brook no compromise with highest quality standards.

### Quality Insurance

This man is seeing to it that your plant produces the best grinding work that's possible for an abrasive wheel to give. Constant quality checks are a part of every step of manufacture here at Cortland . . . your assurance of high quality all down the line.



CORTLAND

CORTLAND GRINDING WHEELS CORPORATION
Chester, Massachusetts

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